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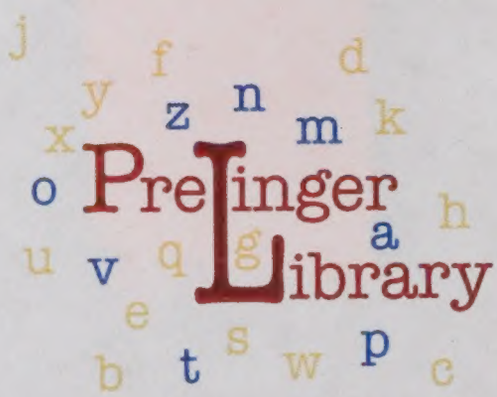

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Governor Calls Water Victory the Greatest Event Since Gold Discovery

Executive Confident Federal Authorities will Approve State's Application for Grant and Loan that will Enable Water Project Authority to Start Construction

By JAMES ROLPH, Jr., Governor of California

ON DECEMBER 19, 1933, the people of California put their stamp of approval on the Central Valley Project of the State Water Plan when by a clear majority of over 33,000 votes the referendum against the Central Valley Project Act, passed by the Legislature on July 26 and signed by me on August 5, was defeated at a special election.

This, my Fellow Californians, in my opinion, was the greatest event that has occurred in this State since the discovery of gold.

The people of this State have long looked forward to a coordinated development of the State's water resources to provide for the most effective and efficient conservation, regulation, distribution and utilization of its water supplies for all purposes.

Efforts looking forward to such a plan of coordinated development were started over sixty years ago during the administration of Governor Newton Booth. Since that time, water resources investigations have been more or less sporadic until the initiation of the intensive investigations authorized by the Legislature in 1921 and continued during the past ten years or more, leading finally to the adoption of initial plans to take care of immediate pressing needs and to the enactment by the 1933 Legislature of an act providing for the construction and operation of the Central Valley Project of the State Water Plan.

The challenge to our future happiness and welfare has been decided unequivocally by the voters at this special election. The decision made is a most constructive one.

JAMES ROLPH, JR.

This great project will provide vital necessities for a continuation of progressive development and increasing prosperity, not only in the Sacramento and San Joaquin valleys, but also in the great metropolitan areas which through the channels of industrial and commercial trade share to a large extent in the prosperity of the great agricultural industry of the two valleys.

Moreover, it is unquestionable that the entire State will be benefited by the consummation of this great project. In addition to furnishing water supplies for highly developed and producing agricultural lands which are facing destruction of investment and production because of serious water shortage, improving navigation to provide cheap water transportation on the Sacramento and San Joaquin rivers and providing greater flood protection to the valley lands,

(Continued on page 8)

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Review of 1933 Highway Work Shows a Total Expenditure of $29,483,000

By **EARL LEE KELLY**, Director of Public Works

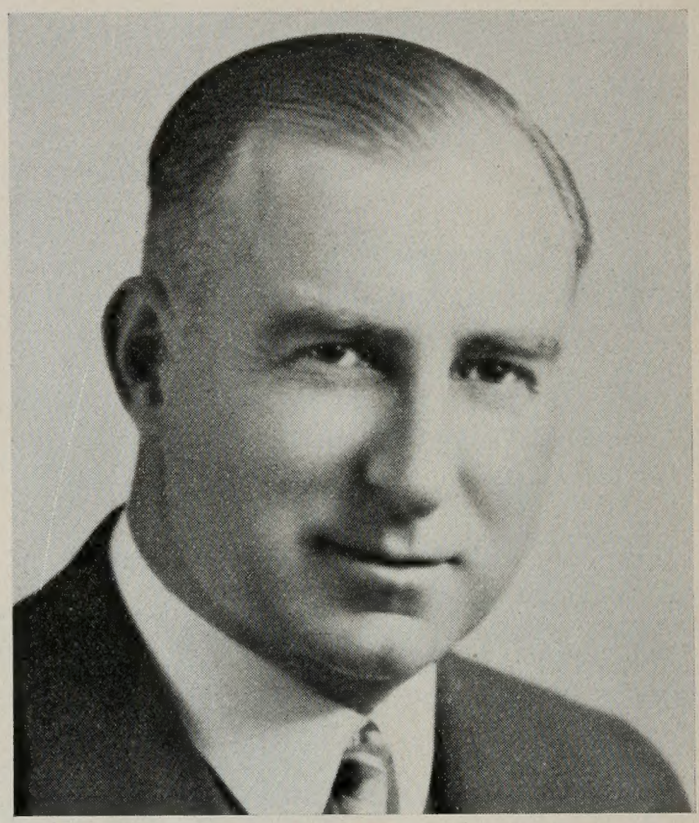
THE year 1933 stands out in relief against the horizon of highway construction history.

It was a year marking the use of highway construction, on a scale never before attained, as a major public work in the hastening of economic recovery.

With reference to California, the following is the part played by the Division of Highways of the Department of Public Works in turning the tide of depression and climbing up on the road to recovery.

With State highway construction for the first eight months of 1933 amounting to little more than $6,500,000, the push for recovery was begun with the advertising for bids on fifty State highway projects on August 25th and continued during the remaining four months of the year with the result that, on December 31st, records showed an accomplishment of more than $14,100,000 in work under way and $2,360,000 in work advertised for bids, making the highway construction total for the year 1933 over $22,900,000.

In addition to the mammoth construction program, maintenance work on the thousands of miles of State highways has been continuously carried on with an expenditure of over $6,500,000, bringing the total amount of construction and maintenance work during 1933 to $29,483,000.



EARL LEE KELLY

REPRESENTS REHABILITATION

This total for the year represents hundreds of miles of new and reconstructed highways; it represents new bridges; it represents progress in the development of an adequate State highway system; but, of far greater import, it represents work for the hands of many thousand Californians; it represents food, clothing and security for their many thousand families; it represents rejuvenation, in these same thousands of Californians, of that spirit of confidence and self-respect which is engendered by honest work.

It is estimated that the men employed on State highway work for the first eight months of 1933 numbered about 5000 and that the work set in motion between August 25 and December 31 provided work for more than 15,000.

This is the double benefit to California from the increased highway construction activity of 1933: work for Californians and increased capital investment in the network of the State highway system.

KALEIDOSCOPIC YEAR

In retrospect, 1933 presented a kaleidoscope of rapidly changing incidents having far reaching effects upon the State highways in California, and no picture of highway activities for the year just passed could be complete without mention of the more important of these incidents which have altered the pattern of activity.

By act of the 1933 Legislature State highway mileage was increased from approximately 7350 miles to 14,150 miles by the transfer of 6800 miles of county roads to the State system. A heavy burden was thus shifted from the counties, enabling them, with their share of the gasoline and motor

Tabulation 1933 Highway Construction

During the calendar year just closed the Division of Highways constructed 1546.2 miles of highways and 62 bridge and grade separation structures, in addition to various minor improvements and miscellaneous contract work, at a total cost of $20,561,500.

To provide an idea of the physical aspects of the year's work the following summary gives the types of construction, mileage and cost for each type.

Type	Miles	Amount
Pavement	180.5	$7,416,800
Bituminous treated crushed rock surface	171.5	2,775,800
Untreated crushed rock surface	38.1	557,900
Graded roadbed	168.8	4,602,000
Bridges and Grade Separations	(62)	2,276,900
Seal Coat, Shoulder Oiling, etc.	987.3	1,006,100
Miscellaneous Contracts	----	397,600
Minor Improvements	----	372,200
Miscellaneous Day Labor	----	527,900
Unemployment Relief and Earthquake Reconstruction	----	628,300
Totals	1,546.2	$20,561,500

vehicle taxes, to raise the standards of construction and maintenance of the county road systems, or to reduce county taxes by the amounts heretofore required for road improvement and maintenance.

CITIES SHARE GASOLINE TAX

The Legislature also provided for incorporated cities by allotting one-quarter cent of the gasoline tax to be distributed among them for street improvement within their limits. This measure has already had effect in many cities where the governing bodies have been able to reduce taxes by the amount of this contribution of State revenue.

On June 27 the California electorate decisively defeated diversion of gas tax revenues for any purpose other than for highway construction and maintenance. In no uncertain terms the highway users of California declared that the taxes they pay on gasoline are for highway purposes only and that any attempt to divert them for general State expenses would be met with determined opposition.

On June 16 the President signed the National Industrial Recovery Act providing approximately $400,000,000 for State highway construction throughout the entire country. Of this amount $15,607,000 was apportioned to California.

BIENNIAL BUDGET REVISED

The California Highway Commission immediately adopted a revised budget for the biennial period from July 1, 1933, to June 3 1935, based upon Federal funds and a pated State revenues. Construction p

(Continued on page 14)

First Annual Report on Bay Bridge Reveals Construction Up to Schedule

CONSTRUCTION on the $75,000,000 San Francisco-Oakland Bay Bridge, starting on July 9, 1933, went through six months of progress on schedule, according to the first annual report made by Chief Engineer C. H. Purcell to Director Earl Lee Kelly of the Department of Public Works. The report in part is as follows:

The work on all the contracts is up to expectations.

Each contractor has performed the amount of work during the first six months of construction which our plans and specifications required.

This work, performed in 1933, included the construction and sinking of two of the world's largest caissons, designed by the San Francisco-Oakland Bay Bridge Division upon an original plan created by Daniel E. Moran, one of our consulting engineers.

UNDERWATER RECORD SET

One pier was sunk in 106 feet of water, which represents the height of a 9- or 10-story apartment house, and which stands as a record for concrete construction under water.

All the substructures of the west bay sector of the San Francisco-Oakland Bay Bridge will be complete in 1934.

During the year 1934 three of the four steel towers of the twin suspension bridges of the west bay crossing will have been completed according to progress schedule, and the concrete center anchorage between the twin bridges will be raised until its top stands 236 feet above water. (Its final height when completed will be 301.5 feet above water.)

SUPERSTRUCTURE BEGINS IN MAY

The San Francisco cable anchorage and Yerba Buena Island cable anchorage will be built up as far as possible pending the cable spinning process which will not start until 1935.

In the east bay, 20 of the 22 piers, or substructures, will be completed during 1934.

Superstructure construction in the east bay will be undertaken during 1934, starting in May, and 30 per cent will be completed this year.

The Yerba Buena Island vehicular tunnel will be 40 per cent completed during 1934, this being the largest bore tunnel in the world, 58 feet high by 76 feet wide. This vehicular tunnel will not be completed until 1936.

EMPLOYMENT FOR 4000

The cable anchorage tunnels, in which the 28-inch cables will be attached to steel eyebars embedded in concrete, will be complete during 1934.

Employment in the San Francisco metropolitan area directly in the construction of the bridge will reach a peak during 1934 of more than 4000 men.

During the year 1933, one pier, Pier W-2, at the tip end of San Francisco Harbor Dock No. 24, at the extreme west end of the bridge, was completed.

Twelve other piers were placed in construction during 1933, some of which are far advanced toward completion.

$25,000,000 BIENNIAL EXPENDITURE

The cable anchorage on Rincon Hill, San Francisco, was built up to 25 per cent of completion, and excavation was started for the Yerba Buena Island cable anchorage during the past year.

Six million dollars were spent on bridge construction in 1933, and $19,000,000 will be spent during 1934.

By the close of 1933, 5000 tons of cable wire, or 25 per cent of the total amount required, had been completed in eastern steel mills, and 2500 tons of this amount have already been brought in ships to San Francisco yards of the Columbia Steel Company.

Nearly 50 per cent of the anchorage steel work has gone through the eastern mills. A small quantity has been delivered and is stacked at Rincon Hill.

Fabrication of two towers is well under way.

During the first six months of bridge construction a total of 110,000 cubic yards of concrete was placed. This is four times the amount of concrete used in the Russ Building, largest office structure west of Chicago.

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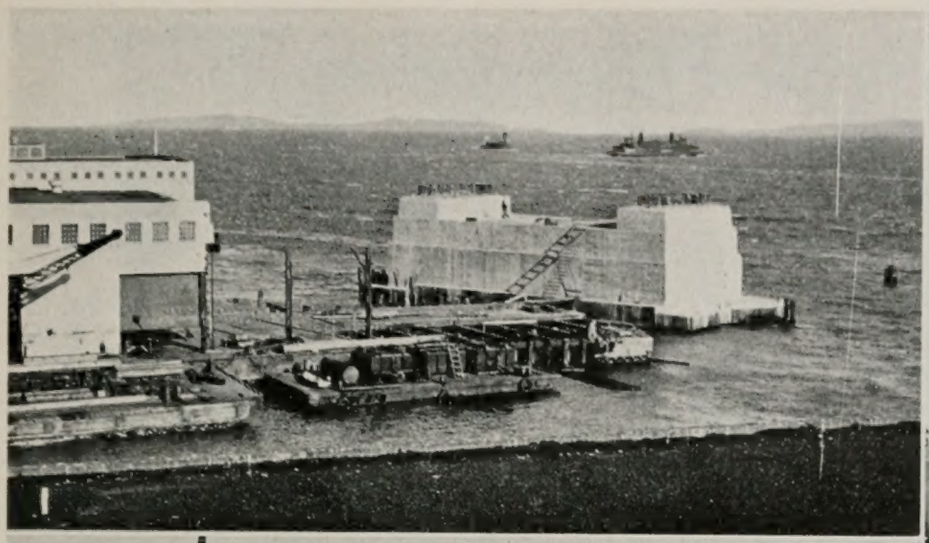
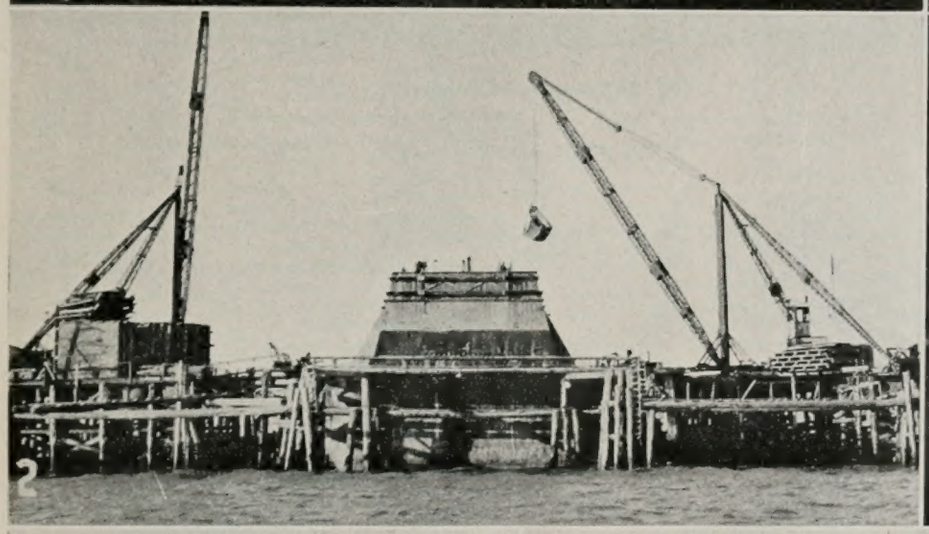
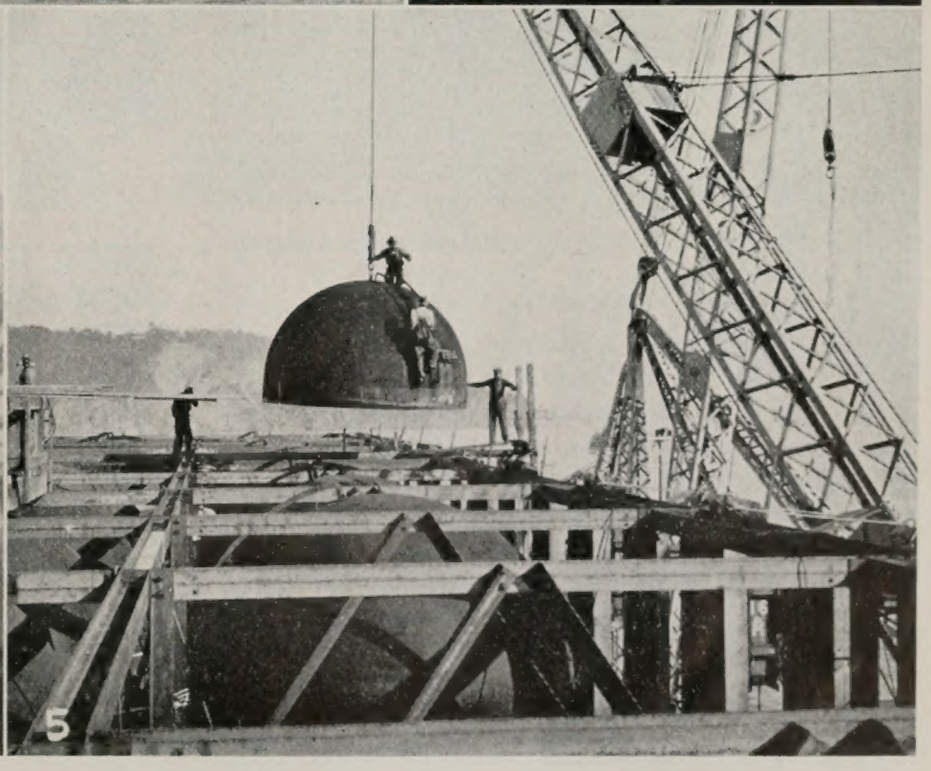






PIERS RISING, CAISSONS SINKING in the waters of San Francisco Bay mark the steady progress of the great Bay Bridge construction. No. 1—Bridge Pier No. 2, the first completed pier, at the foot of Harrison Street, San Francisco, on which will rest the most westerly tower. It is 122 feet long, 52 feet wide and stands 40 feet out of water. No. 2—Pier E-5 with its cutting edge resting 121 feet below the surface and the concrete cellular structure being tapered off. No. 3—Engineers testing the depth of water in a caisson cylinder by lowering a wire device which lights an electric lamp at the upper end when water is touched. No. 4—The sinking of a caisson is accomplished by releasing air from the cylinder. This workman is testing the air pressure of a cylinder much like you test automobile tires. No. 5—Removing domes from the great center anchorage caisson resting on the bottom to permit dredging in the wells. Some of the domes are retained for emergency flotation.

San Diego Celebrates Completion of Million Dollar Highway into City

By **E. E. WALLACE,** District Engineer

FOR many years the northerly entrance to the city of San Diego and to the vicinity south of the city has been restricted to a very unsatisfactory approach over the old Torrey Pines Grade and the Biological Grade through the attractive city of La Jolla and Mission Beach and thence into San Diego over a very tortuous, steep and narrow roadway.

Through the cooperation of San Diego city and county and the State Highway Commission, the final link of the 18-mile alignment through Rose Canyon and around the head of Mission Bay over Atlantic Street to a direct connection with Broadway, the main business street in the city of San Diego, has now been completed.

A MILLION DOLLAR IMPROVEMENT

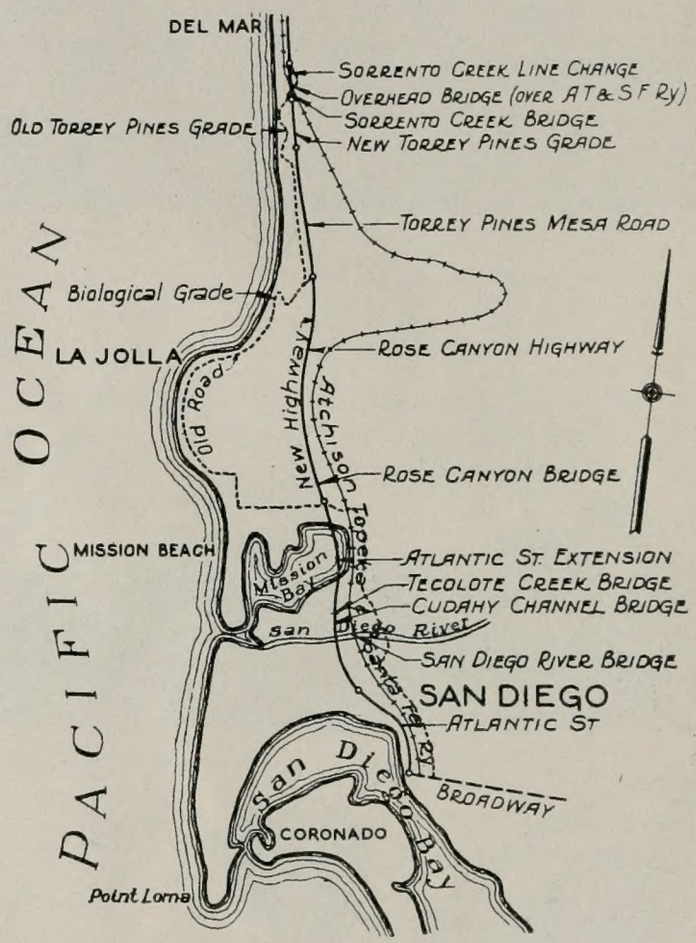
This event was properly celebrated with a public dedication of the highway by members of the California Highway Commission, the Director of the Department of Public Works, Mr. Earl Lee Kelly, and civic authorities, on December 16, 1933, culminating in a dinner and reception given in honor of the State Highway Commission and the Director of Public Works by the city and county authorities of San Diego.

The reconstruction of this important highway has involved an expenditure of slightly over $1,000,000 in order to provide a first class, modern highway on excellent alignment and grade for a distance of approximately 18 miles and has extended over a period of approximately three years.

The road has been constructed in twelve different units or contracts, the last two of which have just been completed, providing the much-needed connection to the business center of San Diego along the scenic and attractive water front. The main portions of this highway traverse the Torrey Pines mesa and grade, the Rose Canyon, Sorrento grade separation and six major bridges.

GRADES, CURVES ELIMINATED

The new alignment eliminates both the Torrey Pines Grade and the Biological Grade which had approximately 50 curves with a minimum radius of 50 feet and a maximum grade of 18 per cent. The new route saves approximately five miles in distance, has nothing less than a 1200-foot radius curve and a 6 per cent maximum grade.



The unit of the project, just completed around the head of Mission Bay, traverses a part of the Mission Bay State Park which is now being landscaped and beautified by the State Park Commission.

This last link provides a most attractive entrance to the city as well as a rapid and uninterrupted access for traffic.

DEDICATION CEREMONIES

The formal dedication ceremonies were held at Sports Field near the connection of the new highway with Broadway and the occasion brought State officials, noted Californians from other cities and leading citizens of Mexico to San Diego. The State was represented by Earl Lee Kelly, Director of Public Works; Harry A. Hopkins, chairman of the

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A JUBILANT CAVALCADE of motor cars, three abreast, sped along the beautiful curving shores of Mission Bay upon the official opening and dedication of the new Atlantic Avenue entrance to the city.

STATE, NAVY AND MEXICO were represented at the official ceremonies. On the speaker's stand, left to right are: Rear Admiral William T. Terrant, U. S. N., Commandant, 11th Naval District; Tom Hurley, chairman, San Diego Supervisors; Earl Lee Kelly, State Director of Public Works; Philip A. Stanton, State Highway Commissioner; Fred Lockwood, City Manager; Frank Forward, San Diego Chamber of Commerce; Chairman Harry A. Hopkins, Highway Commission; Mayor Jno. F. Forward; General Ortiz Rubio, Past President of Mexico.

OVER THE SAN DIEGO RIVER, a noble steel and concrete bridge carries the new highway on a 40-foot roadway. It has a total length of 641 feet.

Advocated by Governor at Inaugural

(Continued from page 1)

the construction of this Central Valley Project will give immediate relief by employment to 25,000 or more workers over a period of three years or more and provide a livelihood for 100,000 persons.

INAUGURAL RECOMMENDATION

Since the inception of my administration I have strongly advocated a speedy solution of the water problems of this State. In my inaugural address, delivered on January 6, 1931, I stated:

". . . A coordinated solution of these problems has long and earnestly been sought. Surely, in California, where water is so precious, the State must devise a general unified plan for the conservation and use of its water against the increasing needs of its increasing population and the demands of the coming generations whose stewards we are. . . . The difficulties are mainly financial. . . . We may not rob or wreck one section, industry, or group in order to sustain another. We must not spend more in salvaging lands than the lands will be worth when salvaged. . . . development should not proceed more rapidly than economic needs of the State require. We must be sure we are right before we go ahead with any plan. Yet we should not permit any section, industry or group to languish and suffer unduly for lack of energetic action on the State's part. I stand ready as Governor to give the Legislature and the distressed localities all the assistance in my power toward finding a practicable solution of these pressing problems. We must not approach these problems in a narrow or sectional spirit. While the benefits sought may primarily affect certain localities, the evils we seek to cure have been brought into being by causes that are not local. . . . We can not heal these real woes by sympathy or fair words, however sincere. Distinctly, the duty of relieving the acute situation caused by the uneven distribution of our water resources and the growing demand on them is mainly the business of the State and not solely of the affected localities. . . .

FEDERAL COOPERATION SECURED

Since that time I have lent every assistance at my command to the purpose of obtaining a plan of development for final adoption and the formulation of legislation giving the necessary authorization for the project to proceed. I dispatched two commissions to Washington, D. C., to confer with Federal authorities and enlist Federal cooperation and assistance in the project, one of which went to Washington in February, 1931, and one in June, 1932.

These commissions were instrumental in personal investigation of the State Water Plan being carried out by the U. S. House of Representatives subcommittee on appropriations for the Department of Interior in July, 1931, by the U. S. Senate Committee on Irrigation and Reclamation in August and September, 1932, and by the Board of Engineers for Rivers and Harbors of the U. S. War Department in November, 1932.

As a result of these investigations by Federal agencies, the project not only received general approval by all Federal agencies investigating but recommendations were also made for Federal financial assistance with a final definite recommendation from the Chief of Engineers of the U. S. War Department for a Federal grant of $7,300,000 to defray a portion of the cost of the project.

LEGISLATION RECOMMENDED

In accord with the authority conferred upon me by the Legislature of 1931 I appointed nine representative citizens to the California Water Resources Commission on August 24, 1931. This commission made a study and report upon all phases of the State Water Plan and particularly the Central Valley Project thereof, including engineering, economic, legal, financial, constitutional and administrative features. The commission recommended the adoption of a constitutional amendment authorizing the Legislature to enact necessary legislation for carrying out a statewide water program and also submitted a draft of a proposed legislative act under which first units of the State Water Plan could be undertaken.

The commission collaborated with a joint legislative committee working on the same problem and the commission's recommendations were similar to those of the committee's. As a result of these efforts, a constitutional amendment was introduced in the Legislature of 1933 and passed on May 5, 1933. In addition, a revenue bond act, creating a water authority and authorizing the construction of the Central Valley Project of the State Water Plan was passed by the Legislature and approved with my signature on August 5, 1933. Both the constitutional amendment and the legislative act largely embodied the recommendations made by the commission I appointed.

HELD UP BY REFERENDUM

"The Central Valley Project Act of 1933," Chapter 1042, Statutes of 1933, A. B. 259, would have become a law on October 25, 1933, had it not been barred by a referendum petition which was qualified for filing on September 23, 1933. If the vote on this referendum had been allowed to go to the next general election it would have permitted the act to remain ineffective until after November, 1934, and would have meant a postponement of relief from acute water shortage, a failure to carry out a project providing for great relief in unemployment and the probable loss of the opportunity afforded to obtain a Federal grant of 30 per cent of the cost of materials and labor and Federal financing of the balance of the cost of the project under the provisions of Title II of the National Industry Recovery Act of 1933.

Accordingly, on October 4, 1933, I called a special election for December 19, 1933, so that the will of the majority of the people in California might be registered in time to arrange for the financing of this most worthy project under the provisions of the National Industrial Recovery Act.

Despite the beclouding of the issue by a well-organized and well-financed opposition whose campaigners raised the bugaboo of an added tax burden, I had no fear in submitting the case to my fellow Californians, who, I was confident, would exercise their good judgment in behalf of the State. The result confirmed my opinion.

STATE WATER PROJECT AUTHORITY in session at their first meeting. Seated, left to right, in this group empowered to administer the Central Valley Water Project Act are: Chairman Earl Lee Kelly, Director of Public Works; Ray L. Riley, State Controller; U. S. Webb, Attorney General; Charles G. Johnson, State Treasurer. Standing, from left to right, are State Director of Finance Rolland A Vandegrift and Edward Hyatt, State Engineer and Executive Officer of the Authority.

REFERENDUM ELECTION ON CENTRAL VALLEY PROJECT

At the election on December 19, 1933, the vote was 459,712 "Yes," and 426,109 "No," or a majority of 33,603 in favor of "The Central Valley Project Act of 1933." Of the fifty-eight counties in the State, forty-four approved the measure while only fourteen were against. Of those counties voting against the measure, seven were in southern California, six in the coastal belt and only one within the area of the Great Central Valley. An analysis of the vote shows that in general all of the valley counties and especially those to be most directly benefited by the project voted overwhelmingly for the act. San Francisco and most of the bay counties also registered a substantial majority for the measure.

I am confident that had there been time and opportunity to properly acquaint the people in all sections of the State with the actual facts and outstanding merits of this great project and the legislative act providing for its construction and operation, all counties in the State would have approved the measure with a substantial majority. I feel sure that it was only lack of knowledge or misinformation, or both, which caused many people to vote "No" on their ballots.

The measure was opposed by selfish interests who waged a most intensive campaign against it and broadcast misinformation and appeals to sectional prejudice in an effort to bring about its defeat. Against this opposition was grouped a band of leading citizens from all parts of the State who undertook voluntarily to present the facts concerning the project and the act to the people.

Leading this group was the State Water Plan Association which was organized on August 26, 1933, for the purpose of furthering the Central Valley Project before the Federal Government and to resist and defeat the referendum against the act.

The officers of this association are: B. S. Crittenden, president and chairman of executive committee; J. M. Inman, vice chairman and treasurer; P. D. Nowell, secretary of association and executive committee.

The executive committee consists of the following: District No. 1, Francis Carr, Redding; District No. 2, Jesse Poundstone, Grimes; District No. 3, A. B. Tarpey, Fresno, and P. D. Newell, Tulare; District No. 4, W. B. Hogan, Stockton; District No. 5, George A. Atherton, Stockton; District No. 6, C. W. Schedler, Pittsburg; District No. 7, Vacancy; District No. 8, Matt I. Sullivan, San Francisco; District No. 9, J. M. Inman, Sacramento; at large B. S. Crittenden, Stockton.

Mr. Clem Whitaker was appointed as campaign manager for the Association on October 9, 1933. The head office of the Association was established in Sacramento and branch offices in Oakland, San Francisco and Los Angeles. Organizations were also set up in most of the counties of the State.

(Continued on page 10)

Election Called to Secure U. S. Funds

(Continued from page 9)

It is to the State Water Plan Association and to the many individuals who joined forces with the Association and voluntarily and unselfishly devoted their time and energy to the campaign in favor of the adoption of the Central Valley Project Act that chief credit is due for the vote of approval given by the people at this election.

Realizing the tremendous importance of this Central Valley Project to California and in line with my expressed convictions since the beginning of my administration, I deemed it my duty as Governor to join forces with these large numbers of leading citizens in favor of the project, and accordingly took an active part in the campaign with appeals to the people of the State through the press and on the radio for a favorable vote on the measure. The result of the election was a most happy one to me and I heartly congratulate all who took part in waging the campaign for the adoption of the Central Valley Project Act of 1933.

Now that the issue has been definitely decided by the people in accord with the established democratic principles of our government for deciding such issues, it is my earnest hope that all of the citizens of this State from all sections thereof will get solidly behind this great project and lend their assistance to the work that remains to be done before the project can be consummated, for, my Fellow Californians, there is still much work to be done and the job ahead calls for the united and whole hearted support of every individual and interest within the entire State.

FURTHER ACTION NECESSARY IN CONSUMMATION OF PROJECT

Further action looking towards the consummation of the Central Valley Project involves two matters of immediate importance:

First—Obtaining the approval of the application to the Federal Emergency Administration of Public Works for a grant and loan under the provisions of the National Industrial Recovery Act of 1933, of funds to finance the project.

Second—The execution of contracts for the sale of water and electric energy to be developed by the project, in order to assure revenues sufficient in amount to meet all carrying charges of the project, including interest on and retirement of principal on the revenue bonds which will be issued under authority of the Central Valley Project Act.

The legislative act approved by the people creates a "Water Project Authority," composed of the Director of Public Works, the Director of Finance, the Attorney General, the State Controller and the State Treasurer. The Director of Public Works is designated as the chairman and the State Engineer as the executive officer of the Authority. This Water Project Authority is authorized and empowered to proceed with the construction of the Central Valley Project, comprising specifically designated units, when, in its judgment, income and revenue from all sources will be adequate to pay all costs of the project, including bond redemption, interest, operation and maintenance.

UNITS OF PROJECT

The Authority is directed to proceed with construction immediately upon funds becoming available therefor. The units designated for the project comprise Kennett dam and reservoir on the Sacramento River with hydro-electric power plants and a main transmission line to a central substation near the city of Antioch, the Contra Costa conduit extending from the San Joaquin delta to Martinez, the San Joaquin pumping system extending from the delta to Mendota, Friant dam and reservoir with a power plant on the San Joaquin River, Madera canal extending from Friant dam to the Chowchilla River and the Friant-Kern canal extending from Friant reservoir to Kern River.

The analyses of the cost of the project and the revenues from the sale of water and power which it appears reasonable to anticipate show that the project will be self-liquidating and self-supporting with Federal financing under the provisions of the N. I. R. A. No State financing is contemplated or permissible under the act.

APPLICATION FOR GRANT AND LOAN TO P. W. A.

In order to expedite matters, I authorized the preparation and submission of an application in preliminary form to the Federal Emergency Administration of Public Works for a grant and loan to finance the construction of the Central Valley Project. This application was filed September 27, 1933, and has been under preliminary consideration by the State Engineer and State Advisory Board of the Federal Public Works Administration in California, and the Public Works Administration in Washington, D. C.

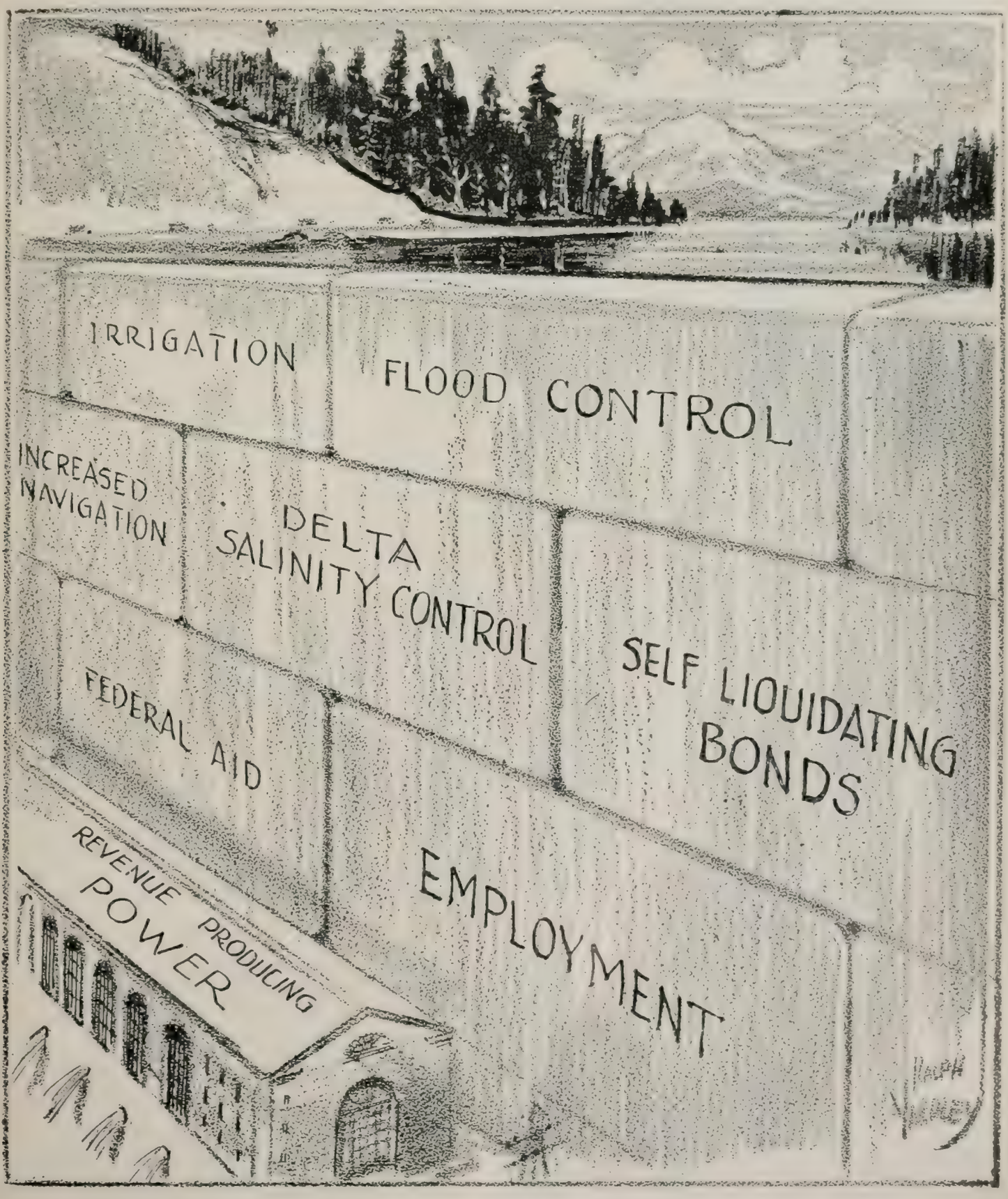
Energetic action is now being taken to press this application both with the Federal representatives of the Public Works Administration in California and also at Washington, D. C. It appears probable that a report by the officials of the

(Continued on page 20)

SOLID BUILDING MATERIAL

State Water Plan Solves Many Problems

Cartoon by YARDLEY in *Stockton Record*



New "M" Street Bridge at Sacramento to be Under Construction in Spring

By **F. W. PANHORST,** Acting Bridge Engineer

AFTER many years of waiting it now appears that the narrow, dangerous and unsightly bridge over the Sacramento River at "M" Street, the westerly entrance to Sacramento, will soon be replaced by a new and modern structure. The budget of the State Division of Highways for the present biennium includes an item of $433,000 as the State's share for constructing a new bridge. Cooperating with the State, Sacramento county has allotted $100,000 of the county's share of the gas tax from the present fiscal year budget and $133,000 from the next fiscal year budget to be used in conjunction with the State funds for the new bridge.

F. W. PANHORST

The present bridge was built in 1910 by the Sacramento Northern Railway Company with financial cooperation from Yolo and Sacramento counties. The railway company secured at that time a 50-year franchise extending to 1960, which has 26 years to run. This bridge, not intended for the heavy highway traffic it now carries, but built primarily for railroad traffic and protected by a 50-year franchise, is to be replaced by a State bridge, built and operated by the State.

NEGOTIATIONS NECESSARY

This situation necessitated numerous conferences of State and railroad officials in order to arrive at an agreement satisfactory to both. The position taken by the railroad company was one of cooperation and an agreement satisfactory to both parties has been executed.

It must be remembered that no possible arrangement of tracks and highway could be such as to be entirely satisfactory to both railway and State. Naturally, the railway company would prefer to have a clear crossing not hindered by highway traffic, and the State would prefer a bridge with no railway interference, but neither the railway crossing nor the highway traffic could be eliminated.

It was, of course, suggested that the highway traffic should be carried over the tracks clear of all rail interference. Such a solution was possible, but the cost would be far in excess of available funds and the property damage to "M" Street due to the long run-off, as well as many other valid reasons which we will not attempt to enumerate here, made necessary the elimination of such an overhead structure.

At a conference held December 22, attended by the railway company and State officials agreement was finally reached on the type of structure agreeable to both. The Department immediately began final plans and specifications so that actual construction may be started as soon as the hazard of spring high water has passed.

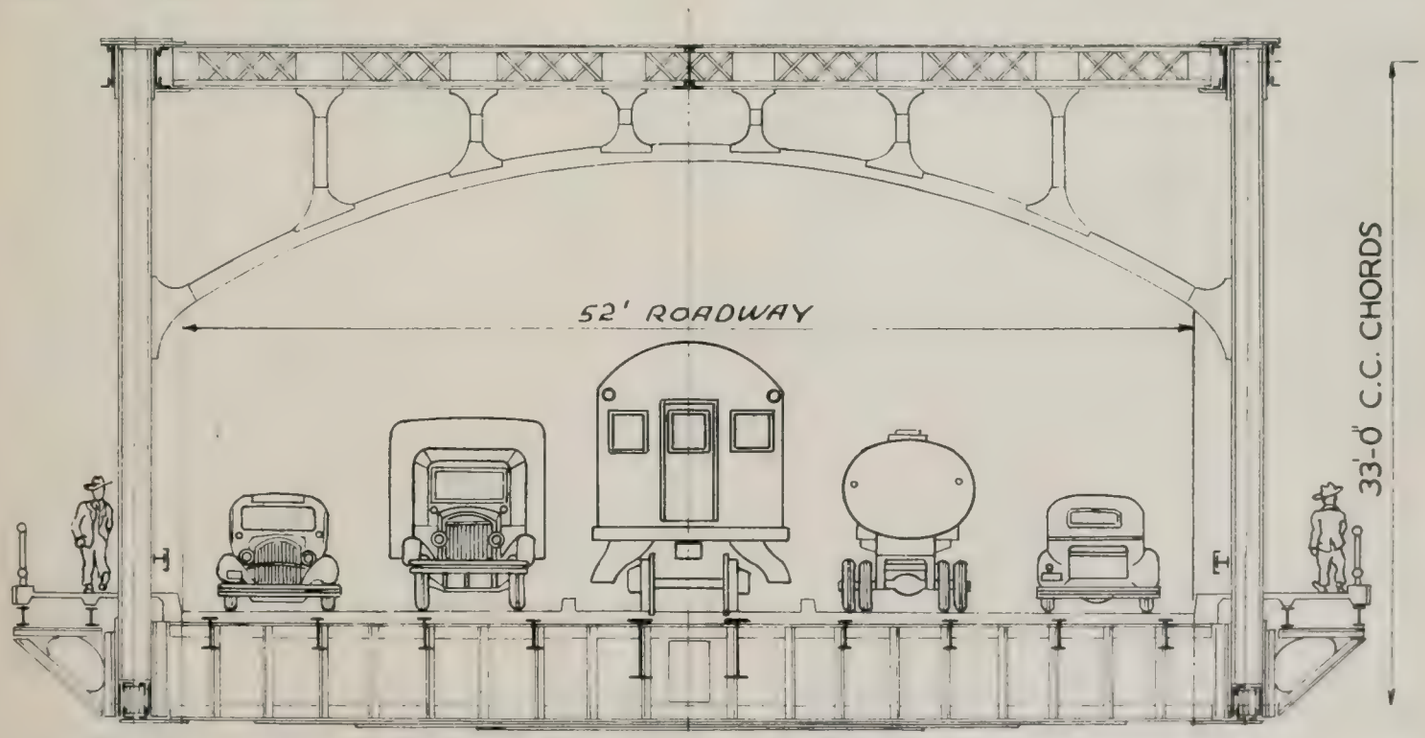
A combination railroad and highway bridge of the vertical lift type will be constructed. The accompanying sketch shows a typical cross section. The clear width between curbs will be 52 feet with the railway tracks in the center, vehicular traffic being protected by curbs which allow 13 feet for railway traffic. Two lanes of highway traffic in each direction will be provided with the outside lanes 10 feet in width and the interior lanes 9 feet and 6 inches. Four-foot sidewalks will be placed on each side of the bridge outside of the girders.

ALL NEW PIERS

Original plans provided for utilizing the present piers but detailed studies have shown that a more economical and satisfactory structure can be secured by building entirely new piers at new locations.

A hearing was held October 18, 1933, before a representative of the War Department and permit has been secured for a clear opening between fenders, for river traffic, of 170 feet and a vertical clearance, with span lifted, of

MODERN IN DESIGN and adequate to accommodate the greatly increased San Francisco-Sacramento traffic to and from the State Capital through the "M" Street gateway this new steel structure will replace the present old, narrow, unsightly bridge over the Sacramento River. It is a lift type bridge, the center span being raised vertically for passage of river craft. The new structure will have an over-all length of approximately 700 feet and cost $700,000. The above architect's drawing is not final in the detail of certain features and units.



TRAFFIC CAPACITY IS DOUBLED on the new "M" Street bridge as shown by this typical cross-section. The 52-foot roadway will accommodate four lanes of highway traffic, two on either side of the Sacramento and Northern Railroad track occupying the middle lane and separated by curbing. In addition, a 4-foot sidewalk for pedestrians is provided on each side of the roadway.

100 feet above high water. The grade of the bridge will be practically the same as at present with a lift span of 209 feet 6 inches in length flanked by two steel spans one 192 feet 6 inches and the other 165 feet in length.

The vertical lift type of structure was decided upon after considering all other possibilities.

NOVEL SURFACING FEATURE

A novel feature of the structure will be the use of light weight concrete for roadway slab and sidewalk. This concrete will weigh but 100 pounds per cubic foot while ordinary concrete weighs 150 pounds. The light weight concrete will give 3000 pounds per square inch compressive strength when 28 days old which is comparable to the heavier concrete now used. The lightness of weight is secured by using a special light weight aggregate.

The value, or economy, of using the light weight concrete is that it materially decreases

(Continued on page 27)

Plans Rushed to Provide Employment

(Continued from page 3)

amounting to approximately $34,000,000 were included in the revised budget.

During the latter part of July and the first three weeks of August a recess in advertising for bids was necessitated to await the 22d of August, upon which date the new State Contract Law, the California Recovery Act and other laws affecting State highway construction became effective. But, under the direction of C. H. Purcell, State Highway Engineer, his assistant George T. McCoy and their able staff of engineers, work in the division offices was rushed so that on Friday, August 25th, fifty projects for State highway construction were advertised.

This unprecedented volume of work instituted under the direct orders of Governor Rolph for the express purpose of relieving unemployment marked the firing of the opening guns of California's Division of Highways' part in the war against economic depression and marked the beginning of the march on the road back to economic recovery. This salient in the line of battle was pushed forward with unabated zeal during the remainder of the year.

TABULATION OF YEAR'S WORK

The following two tabulations set forth a comparison of State highway activities for the first eight months of 1933 with those of the last four months, as well as a comparison of Federal funds and State funds used in getting recovery projects under way:

January 1 to August 24, 1933

Contracts awarded	$5,288,400
Minor improvements	211,000
Earthquake reconstruction	150,000
Unemployment relief	478,300
Miscellaneous day labor work	409,200
Total	$6,536,900

August 25 to December 31, 1933

	Federal funds	State funds	Totals
Contracts awarded	$8,365,200	$5,044,800	$13,410,000
Major day labor	156,700	178,000	334,700
Minor improvements	--------	161,200	161,200
Miscellaneous day labor	--------	118,700	118,700
Totals	$8,521,900	$5,502,700	$14,024,600

Construction started during first eight months	6,536,900
Total construction started in 1933	$20,561,500

A few of the larger and more important projects included in the year's work are listed herewith.

MOST DRASTIC LINE CHANGE

The year 1933 saw the completion of the most drastic change yet made to any one unit of the State Highway System. This change was the construction of the Ridge Route Alternate in Los Angeles County. For many years traffic between southern California and the San Joaquin Valley has battled with the tortuous alignment and adverse grade of the Ridge Route across the Tehachapi and the completion of the alternate, which follows the canyons to the west of the old road, provides a marked saving in time with a great increase in the safety of driving.

The new 30-foot pavement, constructed on an easy alignment, decreases the distance between Castaic School and Tejon Pass by about 10 miles. This improvement, in connection with other work northerly and southerly of it, has provided a modern high speed arterial between the metropolitan districts of southern California and the great valley regions to the north.

Another improvement to a main arterial of the State highway system to be completed during 1933 was the widening of the 4-mile causeway across the Yolo By-pass about five miles west of Sacramento on the San Francisco-Sacramento road. This structure, built in 1915, with its 20-foot roadway, had become inadequate for the large volume of traffic using this important State highway, and its new width of 42 feet clear roadway is ample for the heaviest traffic.

COAST ROUTE IMPROVEMENT

An important improvement to the heavily traveled Coast Route, which connects Los Angeles and San Francisco, is the new 1232-foot reinforced concrete girder bridge across the Ventura River at the city of Ventura, which was completed during the past year. This new bridge, in conjunction with a cooperative paving project on a new routing within the city, has eliminated one of the

Many Major Projects in Year's Work

(Continued from preceding page)

worst sections of traffic congestion on this main artery.

On the Redwood Highway in Mendocino County, reinforced concrete open spandrel arch span bridges were constructed across Big Dann and Cedar creeks about 2½ miles south of Lane's Flat. These graceful arches blend in with the ruggedness of the country and become a part of the scenic beauty of this famous highway.

As a relief to traffic congestion the recently completed bridge which separates the grades of the State highway and Culver Boulevard, southeast of Venice in Los Angeles County, is a structure of notable interest. The separation of grades at the intersection of these two heavily traveled roads in the heart of the southern California beach area will do much to facilitate the movement of the large volume of traffic which concentrates in this section on Sundays and holidays.

REALIGNMENT AT BAKERSFIELD

Important among the larger projects made up of many units and upon which work has progressed during the year is the new alignment of the Los Angeles-Sacramento arterial through and north of the city of Bakersfield. This improvement covers a distance of approximately five miles, and in addition to the modern roadbed and pavement it involves the construction of three reinforced concrete bridges, including the 2300-foot structure across the Kern River, and two grade separations.

Probably the most important project begun in northern California in 1933 is the grading of the American Canyon Route of the main highway between the San Francisco Bay area and Sacramento. This new routing of this arterial is between the Carquinez Bridge and Cordelia in Solano and Napa counties.

The enormity of the construction of this 10.3 miles of State highway may be judged by the fact that it will require the movement of nearly 1,200,000 cubic yards of earth and approximately 14,000,000 station yards of overhaul; the drainage structures will require 10,800 cubic yards of structure excavation, 650 cubic yards of concrete and 35,500 pounds of reinforcing steel. Over 8700 lineal feet of corrugated metal pipe will be placed in sizes varying from 8 inches to 96 inches in diameter.

This new route will cut 6 miles from the distance between Sacramento and the Carquinez Bridge.

Further improvement to the Redwood Highway is noted with construction beginning on the grading and surfacing of 9.5 miles of roadbed between Last Chance Slide and Flannigans in Del Norte County and on 7.6 miles between Benbow and 7 miles north of Garberville in Humboldt County.

BIG ARTERIAL PROJECT

In Los Angeles County the improvement of the Los Angeles-Pomona lateral has been advanced along the Garvey Avenue alignment. The bridge across the San Gabriel River on this project is complete and the El Monte Grade separation is under construction. In the city limits of Los Angeles, improvement to the lateral is noted by the putting under way of numerous street grade separations and paving along Ramona Boulevard.

The construction of the Mt. Vernon Avenue viaduct and its approaches at the entrance of the Foothill Boulevard into the city of San Bernardino marks the largest structure to be begun in 1933 by the Division of Highways.

Grading was completed and surfacing begun on the drastic realignment of the Redwood Highway between Cloverdale and Hopland in Sonoma and Mendocino counties. This improvement, which, by following the Russian River, eliminates the climb over the hills between these two towns, has also involved the construction of three major bridges and two grade separations, construction on all of which began in 1933.

BAY BRIDGE APPROACH JOB

As a unit in the construction of the east bay approach for the San Francisco-Oakland Bay Bridge, the Division of Highways is constructing a graded roadbed of variable width involving dredging out the underlying mud to depths of from 6 to 15 feet below the mud surface level and placing a dredger fill to a completed height of approximately 13 feet above mean lower, low water; furnishing and constructing a rock retaining wall, to act also as a breakwater, to a finished elevation of 13

(Continued on page 19)

Realignment of Redding-Alturas Lateral Takes Route Out of Shasta Lava Beds

By **J. B. HODGES,** District Construction Engineer

THE recent completion and opening to the public of an important section of the Redding-Alturas lateral between Burney and Fall River Mills gives the motoring public of Modoc and Shasta counties 19 miles of modern high standard highway replacing a longer, tortuous old county road that winds through lava beds and over rough country with many curves and grades.

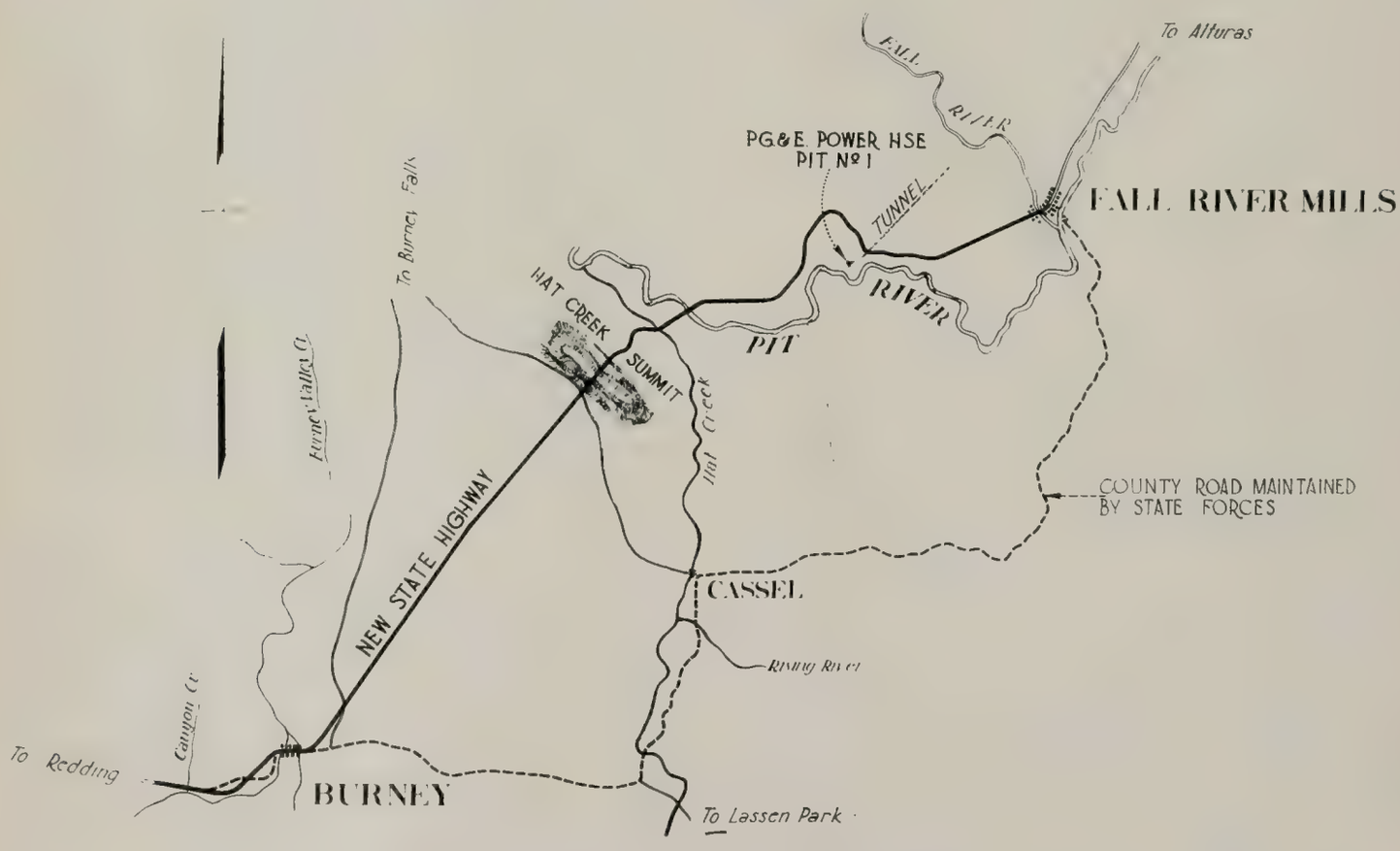
The lateral between Redding and Alturas is of utmost importance to the people of this region, providing access on the west to the Sacramento Valley and the Pacific Highway at Redding and on the north to southeastern Oregon and Idaho. To the sportsmen and vacationists of California it has become more familiar in recent years as the route to scenic areas, good fishing grounds and the mule deer country of Modoc County.

With the completion of the realigned section, there yet remains on this route some 32 miles upon which no major construction work has been performed. This will, however, soon be reduced to 17 miles by an improvement now under way adjacent to Redding.

SHORTER, STRAIGHTER ROUTE

Traffic has been reasonably well provided for by existing county roads which have been under State maintenance since 1926.

The old county road between Burney and Fall River Mills which will soon be little used except as a cattle and sheep driveway, complied only too well with the old saying that "the longest way round is the shortest way home," as doubtless it was at the time it was first placed in use. A glance at the accompanying map will show that much of the new State highway is a straight line, and, consequently, "the shortest distance between two points."



A saving in distance of 4.2 miles, with savings in construction and operating costs, has been made. This reduction in distance, the elimination of curves too numerous to count, as well as radical betterment of

(Continued on page 28)

LAVA BEDS, CURVES AND MILEAGE are eliminated by realignment of the Redding-Alturas lateral between Burney and Fall River Mills. At top, narrow, winding old road through lava beds. Left center, new highway through chalk cliffs near Hat Creek Bridge. Right, construction scene in Pit River Canyon. At bottom, completed road east of Burney with only one curve in 7.5 miles.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY----------Director
JOHN W. HOWE----------Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 12 JANUARY, 1934 No. 1

WHAT ARE HIGHWAYS?

Highways, to the State Highway Commission and to the motoring public, are thoroughfares for traffic traversing the State. They are not mere connecting links from the business district of one town to the business district of the next.

The State Legislature, in acceding to the request of the League of California Municipalities and others to allow the cities a portion of State gasoline tax funds, evidently faced this problem. The Legislature purposely gave the expenditure of these funds over to the State Highway Commission, rather than to the city officials of the individual cities, because they sought to serve the motoring public of the State as a whole and not the individual desire of property owners within the cities which happen to be traversed by State highways.—*Santa Cruz Sentinel.*

THAT WHITE LIFE LINE

Ordinarily a white line doesn't mean much. A white line drawn across a sheet of paper or a blackboard wouldn't of itself be of much account, but a white line extending for miles down the middle of a fog-shrouded or rain swept highway is "something again," as they say in modern slang parlance.

During the recent foggy nights and mornings the white line down the highways has been the means of preventing many serious accidents. Motorists are guided safely along on their own side of the road which would be almost impossible to follow without this help.

We commend the State Highway Department for the fine work that it has done in marking the highways of the State. It has saved many lives.—*Oxnard Advertiser.*

Highway Construction Under N. I. R. A. Act Totals $159,575,000

Progress in award of contracts for public works highway construction has been so rapid in many States as to leave only small balances of the appropriated funds still available for allotment, according to reports of the U. S. Bureau of Public Roads.

At the end of the year, 64 per cent of the $400,000,000 provided for emergency construction of highways by the National Industrial Recovery Act had been taken up in work advertised for contract or started by day labor employed directly by the highway authorities.

Including California that had taken up 68.6 per cent of available funds there were 26 other States that had exceeded the average rate of progress in putting the road money to work as indicated by reports of work advertised for contract or started by day labor.

A total of 5287 projects, estimated to cost $273,849,000 had been advertised for contract or begun with day labor up to December 30, the bureau states. The cost of the day-labor projects included in the above is estimated at $20,160,000.

Of the total number of projects approved by the Federal bureau, 2752 were under construction at the end of the year and 476 were completed. The work under construction, which is estimated to cost $159,575,000, was giving regular employment to nearly 130,000 men at the turn of the year.

32 Curves in 1.9 Miles Will be Reduced to 9

In Humboldt County a drastic revision in alignment is to be made on the portion of the Redwood Highway between Jordan Creek and the South Scotia Bridge, a distance of 1.9 miles. The work involves grading a roadbed 31 feet and 37 feet wide.

That the new alignment will be a marked improvement over the existing road is evidenced by the fact that in the short distance of two miles the number of curves will be reduced from 32 to 9, and the total curvature from 810° to 215°.

He: "I'll bet when you have to do your own washing you wish you'd married some other man."
She: "Yes, I wish I'd married Mahatma Ghandi."

Seven New Projects Now Under Way on the Monterey Coast

TWO road construction jobs and five bridge projects are under way on the Roosevelt Highway along the Monterey County coast.

Between the Carmel River and Carmel, a distance of about 1.9 miles, the road is being graded to a 36-foot roadbed and the selected material surface is being treated by the road mix method. This project is financed under the National Recovery Act of 1933, and is expected to be completed in May.

At the southerly end of the above project a new bridge across the Carmel River is under construction. This is a reinforced concrete structure with a 24-foot roadway and a 2-foot sidewalk on each side.

WITH N. I. R. A. FUNDS

Between Big Sur and 1.6 miles south of Molera's Ranch, the highway is being constructed with a 24-foot roadbed. This project is also financed under the National Industrial Recovery Act of 1933, and will be completed the latter part of June.

Across Willow Creek, about 32 miles north of San Simeon, a timber bridge is under construction. The structure consists of one 76-foot truss span, two 57-foot truss spans, and fifteen 19-foot spans on frame bents. The roadway is 24 feet wide.

Between 52 and 56 miles south of Monterey, three timber bridges are under construction: one across Anderson Canyon, consisting of one 76-foot truss span and twenty 19-foot stringer spans; one across Buck Creek, consisting of one 57-foot truss span and fourteen 19-foot stringer spans, and one across Lime Creek, consisting of ten 19-foot stringer spans.

INCREASE IN NIGHT DRIVING BOOSTS DEMAND FOR REFLECTORIZED SIGNS

Night driving has so increased during recent years that there is much greater demand for reflectorized highway signs, or those outlining direction or warning words with small glass mirror buttons which reflect headlight illumination, reports the Automobile Club of Southern California, official road-marking agency. More than 2500 reflectorized signs are in operation in that section.

The grocer and his wife were discussing the costumes they were to wear at a fancy dress ball. Joan, aged seven, was an interested listener.

"Mother," she said, "can I go as a milkmaid?"

"No, dear, you're too small."

"Well, can I go as a condensed milkmaid?"

Modern Substantial Highways Approved by War Department

IN a recent speech, Roy Britten, Director of the National Highway Users' Conference said:

"The propagandist claims that enormous sums are being expended to build roads of excessive strength to accommodate heavy commercial vehicles to compete with the railroads.

"Federal aid for highway construction is extended to facilitate the movement of the mails and to make provision for the national defense. Recently in approving the uniform size and weight restrictions recommended by the American Association of State Highway Officials the War Department said:

"Highways designed to safely carry vehicles of the weights and sizes provided in the recommended Code, it is believed, will be adequate for the War Department needs in time of war or national emergency.

" 'In the opinion of the War Department, proper provision would not be made for the National defense if our major highways were designed for vehicles of smaller dimensions and weights.' "

REVIEW OF 1933 HIGHWAY WORK

(Continued from page 15)

feet above mean lower low water with a top 4 feet wide. The contract for constructing the dredger fill involves the removal of nearly one million cubic yards of mud and the placing of over three and one-half million cubic yards of dredger sand fill. The construction of the wall along the face of the fill will require approximately three hundred fifty thousand tons of rock. This work is the foundation of the construction for the east bay approaches to the bridge.

Among other important works completed or begun in 1933 are the reconstruction of the Redding-Alturas lateral east of Redding and between Burney and Fall River Mills in Shasta County, construction of the final units of the Crest Route between San Bernardino and Big Bear Lake in San Bernardino County, grading and paving of the Sacramento-Auburn road between Loomis and Newcastle in Placer County, surfacing the Merced-Yosemite lateral between Orange Hill School and Mariposa in Mariposa County and on the Coast Route north of Santa Barbara, grading and paving the 5 miles between Arroyo Hondo and Gaviota Canyon.

Loan Application Made to Washington

(Continued from page 10)

Federal Public Works Administration in California may be expected shortly.

WATER AUTHORITY MET

Following the approval of the act at the election on December 19, the Water Project Authority, created under the act, met on December 22, 1933, in the office of Attorney General U. S. Webb in Sacramento.

Members of the Authority present comprised:

Earl Lee Kelly, Director of Public Works (chairman).

Charles G. Johnson, State Treasurer.

Ray L. Riley, State Controller.

Rolland A Vandegrift, Director of Finance.

U. S. Webb, Attorney General.

Also present were Edward Hyatt, State Engineer and executive officer of the Authority and A. D. Edmonston, Deputy State Engineer and acting secretary.

The Authority decided to press immediately and vigorously the application for a grant and loan to finance the project with the Federal authorities and agencies at Washington, D. C., and authorized State Engineer Edward Hyatt to proceed to Washington, D. C., for this purpose. It was also decided to make every effort to obtain the advice and assistance of the State's representatives in Congress in furthering early and favorable consideration by the Federal authorities.

COMMITTEE APPOINTED

It was further agreed that a suggestion be made to the State Water Plan Association to the effect that they appoint a committee to cooperate with the Authority in the various actions under way.

Representing the Water Project Authority in Washington, D. C., in addition to State Engineer Edward Hyatt, will be Attorney General U. S. Webb, who is in Washington, D. C., on other State business as well, and also Director of Public Works Earl Lee Kelly, Chairman of the Authority. The Authority will be assisted in Washington by representatives of the State Water Plan Association.

WATER PLAN ASSOCIATION LENDS COOPERATION

A meeting of the State Water Plan Association was held in Sacramento on December 29, 1933, to initiate and perfect an organization and program to assist in furthering the consummation of the Central Valley Project. A steering committee was authorized composed of the following members:

James M. Burke, Visalia.
John B. McColl, Redding.
John C. Austin, Los Angeles.
Robert P. Easley, Antioch.
B. S. Crittenden, Stockton.
C. F. Reid, Oakland.

A subcommittee was authorized to outline a method whereby communities could put themselves into a position to obtain water and power from the Central Valley Project and thus make it possible to enter into contracts with the Water Project Authority for the purchase of water and power, thereby putting the Authority in position to guarantee to the Federal Government the revenue required to justify a grant of 30 per cent of the cost of materials and labor and a loan to cover the balance of the cost of the project to finance its construction.

UTILITY DISTRICTS RECOMMENDED

This committee has already made a preliminary report under date of January 5, 1934, recommending the establishment of a series of municipal utility districts under the law governing organization thereof found in the Statutes of 1921, page 245, Chapter 218, as subsequently amended.

On January 8, 1934, the State Water Plan Association authorized Senators J. M. Inman and John B. McColl to proceed at once to Washington, D. C., to lend their assistance in obtaining favorable action by the Federal authorities on the State's application for a grant and loan to finance the Central Valley Project.

FAVORABLE ACTION ANTICIPATED BY P. W. ADMINISTRATION

Although it is understood that the $3,300,000,000 appropriation provided by last year's Congress for construction of public works has now been allocated to various approved projects throughout the Nation, the advice from several sources in the Federal administration is to the effect that an additional substantial appropriation for more public works projects will be made at the present session of Congress.

It is anticipated therefore that Federal funds will be available for financing the Great Central Valley Project and I am confident that the Federal authorities will approve the State's application for a grant and loan which will enable the Water Project Authority to start construction of this great project during this year.

The Project has been approved by all Federal agencies which have had it under investigation during the last three years. It has been approved by Con-

President's Letters Are Sympathetic

(Continued from preceding page)

gressional committees from both houses, by the U. S. Army Engineers and by the engineers of the U. S. Bureau of Reclamation.

FEDERAL OFFICIALS APPROVED

The Chief of Engineers of the U. S. War Department recommended a direct Federal contribution of over seven million dollars towards the construction of the Kennett Reservoir in behalf of navigation improvement and flood control. The U. S. Senate Committee on Irrigation and Reclamation reported favorably on the project and recommended Federal financial assistance. In consideration of the favorable approval of all Federal agencies which have heretofore investigated the project, I feel that we may be assured of favorable action by the Federal Emergency Administration of Public Works.

It may be expected that the Water Project Authority will be successful in negotiating contracts for the sale of water and power which will assure the necessary revenues to guarantee the discharge of loans by the Federal Government for construction. Both the water and electric energy to be developed by the project are needed and careful studies made by the State Engineer and reviewed by eminent consulting engineers conclusively show that both the water and the power are needed and can be used and sold in the available markets to produce the requisite revenues.

LETTERS TO GOVERNOR FROM PRESIDENT ROOSEVELT

I have received two communications from President Franklin D. Roosevelt showing his sympathy and favorable regard for the Central Valley Project. On July 7, 1933, the President wrote me in part as follows:

"I am sorry that the pressure of international affairs and the immediate problem of getting the reconstruction program into full swing prevented me from personally going over this matter as, of course, you know my deep interest in projects of this sort.

I sincerely hope that you will meet with great success in this very constructive work in which your State is engaged.

Sincerely yours,

FRANKLIN D. ROOSEVELT."

On November 22 I received another communication from the President with reference to the policy of the Public Works Administration in respect to public works projects in California which I quote in full:

"My dear Governor Rolph:

I have your telegram of November 13. Secretary Ickes tells me that he gave out no statement with reference to a further allocation of funds to California. I am informed that two senators from another State, following a general conference with Secretary Ickes, gave out an interview which was widely quoted, especially on the Pacific Coast. This interview did not represent Secretary Ickes' views.

Secretary Ickes sent a telegram to Senator Hiram W. Johnson on November 20 which does state his views, which telegram was as follows:

'Re tel. I certainly never meant that California would be cut off in future but merely that for time being we would have to proceed with greater discrimination until allotments to other States which have not received their full quota could be increased. I know that California has many worthy projects still awaiting action. I appreciate the unemployment situation in your State and I would gladly favor further immediate allocations to California if they could be made in fairness to other States. I hope that this is temporary situation so far as California is concerned and that we may be in position shortly to aid you further in your program of public works. You may quote me to this effect if you care to do so.'

In addition to the foregoing telegram to Senator Johnson, Secretary Ickes last week, in response to a telegram from the San Francisco Chronicle, telegraphed that paper as follows:

'Re tel. Public Works Board will continue to consider projects from California on their merits but we must use great discrimination because so many States have not yet had fair proportion of public works funds while California with other western States have already been generously dealt with. We are not committed one way or the other on one hundred seventy million dollar Central Valley Water Conservation and Development Project.'

I hope that this statement of the situation will correct any misapprehensions that exist in your State with reference to the policy of the Public Works Administration.

Sincerely yours,

(Signed) FRANKLIN D. ROOSEVELT."

I have also received communications from several of our congressional representatives offering their assistance and promising their active support and their cooperation with the State's representatives. I am hopeful that every congressmen from this State will get actively behind the State's application and assist in obtaining favorable action.

I look forward, my fellow Californians, to great and lasting benefits from this project—to greater happiness and increased prosperity for the Sacramento and San Joaquin valleys and the entire State. The expenditure of this large sum of money for construction and the employment created will be a great impetus to an immediate increase in prosperity, but the more enduring benefits which will emanate from this great undertaking are of even greater importance.

GODSPEED TO OUR REPRESENTATIVES IN WASHINGTON, D. C.

Scheme of Numeral Designations for U. S. Roads Wins Success

IN an interesting article by E. W. James, Chief of the Division of Highway Transport of the U. S. Bureau of Public Roads, Mr. James tells of the confusion and resultant inconvenience caused to motorists by the old practice of giving different names to portions of through highway routes and the history of developments that led to the adoption by the bureau in 1925 of a complete, uniform scheme for designating and marking a system of U. S. highways.

"In this ambitious project" says the article "the cooperation of the Secretary of Agriculture was invited, and he concurred by approving the plan, and designated a board consisting of 21 representatives from as many States, and of three representatives from the Bureau of Public Roads.

"After nine years the wisdom of the course pursued can no longer be questioned. The joint board designated a total of 75,000 miles of routes to be marked and provided a method for increasing this number.

124,758 MILES IN SYSTEM

"At the present time the system comprises 124,758 miles. The trail associations so far as they cause embarrassment or annoyance have almost entirely disappeared. Several at once converted themselves into proponents of one or the other of the principal numbered U. S. highways. For several years, the 'U. S. 40 Association' was active but it was soon seen that the plans of the several States for systematic construction were actually producing the very results for which the earlier associations stood, and it became evident that their continued existence was no longer necessary.

"The routes selected were designated by a systematic scheme of numbering. Those routes which were generally north and south in direction were given odd numbers, with Route No. 1 close to the Atlantic Coast and Route No. 99 close to the Pacific. Even numbers were used for routes whose direction is generally east and west, with the low number along the Canadian border and the high number along the Gulf Coast and Mexico.

SCHEME PROVED SUCCESS

"Among east and west routes No. 10 and its multiple were used to designate the most important and longest of the transcontinental connections. Among the north and south routes No. 1, No. 11, No. 21, etc., were similarly used. The success of this scheme seems today unquestioned.

"Routes are known by their numbers almost to the point of attaining a certain individuality. Route No. 30 is known in every community through which it passes. Routes Nos. 40 and 50, and especially No. 90 along the Gulf Coast are equally well known. Route No. 1 on the Atlantic has the distinction of having been used by writers of fiction in describing the travels of their characters, and newspapers, radio announcers and other channels of road information regularly use the U. S. designations.

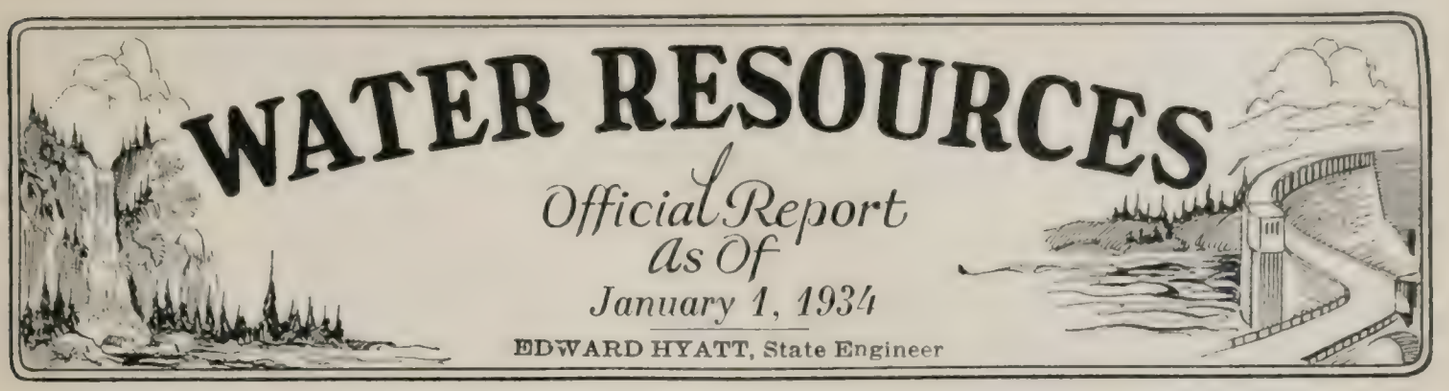
ENGLAND HAD WEIGHT LAWS FOR VEHICLES 150 YEARS AGO

Three years before the Declaration of Independence there was enacted a weight law for vehicles using the highways in England. It provides that:

"To every waggon with wheels of less breadth than six inches the weight to be carried shall not be greater than three and one-half tons." It then provided for increasing weights as the breadth of the wheels was widened until the upper limit was reached: "To every waggon upon rollers of the breadth of sixteen inches," the law reads, the weight was limited to 8 tons.

"The distance from wheel to wheel (width between wheels on same axle) shall be not more than four feet two inches. . . ." Axle spacing was limited as follows: "And the distance from the centre of the fore wheel to the centre of the hind wheel . . . be not more than 9 feet to be measured from the centre of the axles."

As in the present day statutes which give exemptions to farmers, there was the provision that, "The regulations of weight shall not extend to wagons, carts or carriages employed only in husbandry . . . or carrying hay, straw, fodder or corn unthreshed." Again, as governmental vehicles are exempted now, so the law then provided that, "nothing contained shall extend to any chaise-marine, coach, landau, berlin, chariot, chaise . . . or the carriage of ammunition or artillery as shall be for his Majesty's service."



The State Civil Works Administration has approved of three projects totaling more than $370,000 for flood control maintenance and channel clearing affording work for many unemployed laborers. The recent storms bringing a greatly increased water flow have resulted in practically eliminating salinity in the delta regions. An increase in applications for the construction of dams is noted, due to opportunity afforded for financing such projects under Federal aid. News of the irrigation districts, water applications and other activities of the department are contained in the following report of State Engineer Edward Hyatt:

Large numbers of relief employment laborers are being assigned to repairs, ditch cleaning and other irrigation district maintenance work throughout the State. At its meeting December 7th, the board of supervisors of Modoc County found for the sufficiency of a petition requesting authority for the formation of the South Fork Irrigation District and referred the same to the State Engineer, who upon investigation of the project, reported that he had found no objection to the proposal for organization.

FLOOD CONTROL AND RECLAMATION

Upon application of the Director of Public Works, the State Civil Works Administration has approved Project No. 502 for various items of maintenance work in the Sacramento River Flood Control Project in Sacramento, Yolo, Yuba and Sutter counties. This involves a total of 71,200 man-hours labor, to cost approximately $53,380, including tools, supplies and transportation. The cost of supervision will be carried by the maintenance appropriation.

So far the respective county CWA committees have not been able to allocate men to this work, the available quotas being engaged on local projects.

Upon application of the State Reclamation Board, the Civil Works Administration has approved Project No. 503 covering construction, clearing and grubbing in the Sacramento Flood Control Project in Sutter, Yuba and Yolo counties, at an estimated cost of $312,172 for labor, and this office has been requested to supervise the work, for which purpose funds from $8,000 to $12,000 have been allocated out of which tools and transportation will be provided. This work is ready to proceed immediately as far as this office is concerned, but men are not yet available in the various counties on account of the small quotas being occupied on various local projects.

Russian River Jetty.

During the past few weeks work has been so interrupted by storms that only approximately 60 per cent of the normal month's work could be done. A severe storm on December 10th caused considerable damage to the trestle, breaking off and removing the caps and stringers on the five spans at the outer end, a length of 75 feet. Upon application of the Director of Public Works, the State Civil Works Administration has approved Project No. SLF 70 for the continuance of work on the Russian River Jetty. This involves the employment of 24 men for a period of 22 weeks at a labor cost of $12,500 with an allowance of $3,520 for materials. Large rock in considerable quantity is now being produced in the quarry, so that effective work can be done.

Pajaro River.

The State Civil Works Administration has approved an item in Project No. 502 for additional clearing in the Pajaro River channel, to be equally divided between the counties of Santa Cruz and Monterey. This work involves 8000 man-hours and a cost of $6,000, including tools, transportation and contingent expense. This work can be gotten under way just as soon as the men can be furnished from the county quotas.

WATER RIGHTS

Supervision of Applications to Appropriate.

During the month of November 42 applications to appropriate were received, 14 denied and 18 approved.

Among the applications received were 5 of considerable magnitude by the Imperial Irrigation District, which proposes the construction of five power plants along the route of the All American Canal. The estimated cost of the development is $6,100,000. The electrical installation will approximate 125,000 h.p.

As a result of recent storms the flow of the Sacramento River at Sacramento has increased from about 4000 second-feet at the last of November to 22,000 second feet on December 16th.

At the time salinity sampling was discontinued on November 1st the salinity at Collinsville was 360 and at Antioch 270 parts of chlorine per 100,000. With the recent increase in the flow of the rivers to the delta this salinity at the lower point of the delta should now have been practically eliminated.

DAMS

Judging from the many inquiries, requests for rules and regulations and detailed questions on requirements,

(Continued on page 31)

Seventeen Grade Crossings Eliminated by New Structures and Realignments

By **PAUL DUNCKHORST,** Assistant Bridge Construction Engineer

ALTHOUGH somewhat lost to view in the present intensive program of highway and bridge construction, the work of grade crossing elimination throughout the California State Highway System is advancing. The Department of Public Works through its Division of Highways is constantly at work on this important problem.

As pointed out in the recent joint report on the grade crossing situation by the California State Railroad Commission and the Division of Highways, the crossings are necessarily given consideration in groups of relative importance, the first or most important group being those involving the intersection of trunk line highways with main line railroads where volume and normal rate of traffic speed demand complete elimination of the hazard.

ELIMINATING HAZARDS

It is to the separation of grades at this type of crossing that the Division of Highways is, in the main, directing its attention. Among exceptions are a few crossings over main line tracks and yards within municipalities, notably the bridge over the Santa Fe Railway in Barstow, and the Mt. Vernon Avenue Viaduct, now under construction in the city of San Bernardino.

Within the past few years eight separation structures have been constructed on the Redwood Highway. Sixteen have been built on the Sacramento-Reno road, twenty between San Francisco and San Diego, and twenty at various other locations. In addition to these there are seven crossing jobs now under contract for completion before the end of the coming summer.

SEVEN JOBS UNDER WAY

Two of the structures now being built are on the Cloverdale-Hopland relocation of the Redwood Highway; one at Preston in Sonoma County and the other at Hopland in Mendocino County, which will bring the total to ten separations completed on this famous highway during the past five years.

Two miles north of Ventura, the Coast Highway passes under the Southern Pacific Railroad on one of those tricky, reverse, hope-I-can-make-it-at-this-speed, curves through a structure which ever-increasing traffic has rendered too narrow. This situation is being corrected by replacing the old crossing with an overhead with easy grades and approaches. The new bridge has 40-foot roadway, with two 5-foot sidewalks.

On Garvey Avenue near El Monte in Los Angeles County an undercrossing is under construction on new projection of the Imperial Valley Highway, Los Angeles to Yuma.

TWO IMPORTANT VIADUCTS

A busy crossing, especially in the fruit season, is the one at McConnel fifteen miles south of Sacramento where the central valley highway crosses the double track line of the Southern Pacific Railroad. An underpass with a 33½-foot roadway clearance and one 5-foot sidewalk is under contract at this point.

Outstanding among the separations recently built is the bridge across the main lines and yards of the Atchison, Topeka and Santa Fe Railway in Barstow, San Bernardino County. As described in a previous issue of this magazine, the structure is 1163 feet long, consisting of three 175-foot through steel truss spans, one 76-foot and two 65-foot steel girder spans, and 435 feet of timber approach. The structure has a concrete deck with 24-foot roadway and one 5-foot sidewalk, and cost $158,000. It carries traffic over three main line tracks and twenty yard tracks.

CROSSES 35 TRACKS

A similar project is the Mount Vernon Avenue viaduct under construction in the city of San Bernardino on Foothill Boulevard, State Highway Route 9, between that city and San Fernando in Los Angeles County. It crosses two Santa Fe main line tracks and 33 yard tracks. The bridge is 1016 feet long, consisting of seventeen deck steel girder spans varying from 25 feet to 90 feet long and three concrete spans, with a 40-foot roadway and two 3½-foot sidewalks, costing $223,000 when complete.

During the past year the old overhead crossing at Elwood, in Santa Barbara County, has been replaced by a new structure. At Madrone, about 20 miles south of San Jose on the Coast Highway, a new underpass was built replacing a dangerous crossing at grade.

(Continued on page 27)

Newly Completed Grade Separations

Underpass on Coast Highway near Madrone in Santa Clara County where traffic proceeds beneath railroad tracks through a wide subway having planted slopes and sidewalk facilities.

Close-up view of Madrone separation looking across 45-foot roadway at east abutment showing skew of overhead structure and sidewalk facilities with arched openings through abutment.

At Sorrento Canyon near Del Mar in San Diego County the heavy traffic of the Coast Highway is carried over a railroad on a 550-foot structure providing a 42-foot roadway and a 4-foot sidewalk.

Bay Bridge Towers to Rise this Year

(Continued from page 4)

The employment peak of 1933 was reached in November with 2100 men at work in the bay region in addition to those in eastern steel mills. At the close of the year 1933 the pay roll stood at 1990.

Construction of the huge cellular steel towers by the Columbia Steel Company in Pennsylvania mills was started in August, and now the most westerly tower of the bridge is 50 per cent completed. These towers are manufactured in segments and the segments erected by creeper derricks on the site.

The smaller towers are 465 feet high, the larger ones 505 feet high, and there are two of each size. These huge segments, according to officials of the Columbia Steel Company and American Bridge Company, will be shipped out to San Francisco by rail, necessitating in some instances specially designed railroad cars.

ERECTION WORK TO START

Each tower consists of two shafts joined with diagonal cross bracing, and set upon a base-plate of engine-turned steel some four inches in thickness which rests upon the top of the concrete pier. The shafts of the tower are cross-shaped and taper from an overall dimension at the bottom of 36 feet by 19 feet to 15 feet by 12 feet at the top.

Erection of the first of these towers on the San Francisco harbor line will be started early in 1934 and, as before mentioned, three of them will be completed during 1934 and the fourth one early in 1935.

Beautification of the bridge has been a matter of the personal concern of the Director of Public Works and has not been overlooked. A board of architects consisting of Timothy L. Pflueger, Arthur Brown, Jr., and John J. Donovan has during the year produced a pleasing design for the huge concrete masses on Rincon Hill at the cable anchorage, and we incorporated their suggestions in the angles of the tower bracing in order to embody aesthetic principles in these huge structures.

One of the most pleasing aspects of the bridge construction of 1933 has been the fact that the first use of the compressed-air-flotation open-dredging-well caisson has checked so fully with our expectations.

PRECEDENTS ESTABLISHED

Throughout this bridge we have followed, whenever possible, established precedence in bridge construction. It was, however, necessary, because of the great depth of rock to which we had to go in our pier construction, as well as the great depth of water, that we make precedents in pier construction. It was even necessary for us to design an entirely new method of pier construction based on an invention of one of our consulting engineers, Daniel E. Moran, as has been pointed out.

These caissons have now passed most of the dangerous stages and each has acted in full accord with our expectations. To plan on drafting boards the sinking of a caisson in 106 feet of water, and to engineeringly conjecture on its actions under given conditions in advance of construction, and then to observe the actual operation reacting in every respect as predicted, is of particular satisfaction to engineers.

The rule of the San Francisco-Oakland Bay Bridge Division is to build a bridge rather than set precedents or invent new methods of construction, but nature forced us into some precedent-making operations and these operations have checked with plans as far as we have gone.

IMPORTANT IMPROVEMENT FOR OWENS VALLEY HIGHWAY

An important improvement to the Owens Valley-Tahoe road in Mono County is to be made on the 9.7 miles between Crestview and two miles south of Rush Creek, just southerly of Mono Lake. This project involves a complete reconstruction of this section of State highway with respect to both alignment and grade.

The present road is of low standard, unsuited to modern traffic as it follows the natural contours and undulations of the mountainous terrain in this section.

The new roadbed will be 24 feet wide and will be surfaced 20 feet wide with bituminous treated selected material.

"What historical background is there," queries a Yarmouth youth, of the Boston Transcript, "for the hateful habit of forming good resolutions on New Year's?"

"The historical fact," pedagoged the editor, "that every time Eve changed her dress, she turned over a new leaf."

Temporary Bridge to Carry R. R. Over Sacramento River

(Continued from page 13)

the dead load on the bridge which in turn permits of smaller sized steel members.

As far as possible, the structure will be given suitable architectural treatment. The State Division of Architecture is cooperating to insure an esthetic structure.

Special attention is being given to the entrance and exit to the bridge in order that a pleasing appearance will be secured. Special attention is also being given to the approach across Front Street that a smooth street grade will replace the existing rough journey over the various railway tracks.

TEMPORARY BRIDGE NECESSARY

During construction of the bridge vehicular traffic will be routed over the "I" Street bridge and rail traffic over a temporary bridge to be built just upstream from the existing "M" Street bridge.

After considering all possibilities of rerouting the rail traffic across the river the most economical solution was to build a temporary bridge using old railroad girders, which are available, supported by timber pile piers, with a temporary movable span to provide for river traffic.

The changes on the "I" Street bridge consisting of improving the sharp kinks by widening the bridge four feet at these points, will be started in the near future so that the work will be completed prior to the award of contract on the "M" Street bridge which will be in April or May of this year after danger of high water is passed.

RICH TOURIST CROP IN CANADA

Tremendous profit derived from motor tourist travel is well illustrated in a recent report from Canada reaching the Automobile Club of Southern California. This reveals that during 1932, despite economic conditions, the Canadian Dominion received a revenue of $165,000,000 from motor tourists. In 1931 United States motor tourists spent $250,000,000 there. Visitors totaled 15,000,000 in 4,909,989 cars, which if strung out in a line would more than reach around the world at the equator.

First Motorist—I see you got the rear end of your coupe built over into a rumble seat.

Second Motorist—Yes, and the whole job only cost me $100.

First Motorist—Gosh, is it worth that much to you?

Second Motorist—It sure is! You see, my mother-in-law is with us now.

New American Canyon Route Avoids Five Railroad Crossings

(Continued from page 24)

In addition to the elimination of grade crossings by means of structures, the Division of Highways reconstructed portions of some of the trunk line roads on new location, thus eliminating some hazardous situations. Prominent among these are the new road from Gold Run to Airport in Placer County on the Donner Pass route, and the American Canyon cut-off under construction between Cordelia and Carquinez Bridge in Solano County.

The American Canyon cut-off is a newly-established route adopted into the State Highway System by the last Legislature. The northern entrance to this cut-off will be through an undercrossing at the Southern Pacific Line one mile south of Cordelia. The cut-off avoids five crossings at grade with branch lines of the railroad between Napa wye and Vallejo, and shortens the distance from Sacramento to Oakland by six miles. Bids have just been received for the building of the Cordelia underpass.

The Gold Run to Airport relocation not only converts 13½ miles of tortuous turns into 11½ miles of safe fast highway but eliminates two grade crossings with the main line of the Southern Pacific Railroad to Ogden. It also does away with a narrow and otherwise inadequate timber crossing at Gold Run. One of the grade crossings is three-quarters of a mile east of Gold Run and the other is at Alta. The old road also crossed two spur tracks at Gold Run. The new highway crosses the railroad through a new underpass one-half mile east of Towle, one of the sixteen recently constructed between Sacramento and the Nevada State line.

IMPROVEMENT AT MODESTO

Still another noteworthy project is the realignment of the highway immediately south of the city of Modesto which eliminates the grade crossing at Hatch. The old highway, after paralleling the railroad for miles, took one of those unreasonable jumps across the tracks at Hatch, and continued still parallel and adjacent to the railroad into Modesto. Now, instead of crossing the tracks at Hatch, the new highway continues along the easterly side of the railroad into Modesto, crossing the Tuolumne River on a steel and concrete bridge which was a part of the project.

Route Cuts Through Cinder Mountain

(Continued from page 16)

grades, effects a saving in time for the average driver of between 15 and 20 minutes on the trip between Burney and Fall River Mills.

THROUGH LAVA BEDS

The old road, especially between Cassel and Fall River Mills, passed through lava beds and down into miniature craters. This was interesting at first, but not a pleasure after many trips, and can be forgone in favor of the more varied and spectacular scenery on the new State highway.

On the new highway many lava ledges are cut through west of Burney and east to Hat Creek Summit. Through this section there is also some splendid virgin timber, and with the easy rolling grades, the long tangents are not monotonous, as in some locations.

From Hat Creek Summit the new road descends to cross Hat Creek and Pit River on new bridges constructed during the past winter at a combined cost of $58,000. Meadows at Hat Creek and Pit River offer a pleasing contrast to the more rugged and primitive country adjacent.

The view at the crossing of the Pit River is especially attractive, and both Hat Creek and Pit River justifiably intrigue the fisherman. Chalk cliffs, in this vicinity of nearly pure diatomaceous earth, and the accessibility of the streams, afford an opportunity to demonstrate that rock will float.

ALONG CANYON BLUFFS

Soon after crossing the Pit River, a gradual ascent on a 4.2 per cent grade is begun to the bluffs of the Pit River Canyon. For a distance of approximately one mile the new construction lies along abrupt cliffs above the canyon. The river, with beautiful falls, is plainly visible from the new highway, as well as an old, abandoned toll road at the river's edge.

At the eastern end of this canyon section, a mountain of volcanic cinders was cut through in constructing the new highway. These cinders, which vary in color, being red, gray and black, were found to be very useful as well as ornamental. Considerable economy was effected by using them as a "sub-base" under the surfacing, as well as for surfacing material on the shoulders.

After passing through the canyon, the new road follows a "bee line" through prairie country to Fall River Mills, and at this point joins previously constructed State highway.

The interesting and aggressive pioneer towns of Burney and Fall River Mills have assumed a metropolitan air by reason of the full width street section provided by the new construction.

ENTIRELY NEW LOCATION

The construction covered by the above contracts starts at a point 2.3 miles west of Burney, and except for a short section in the vicinity of Canyon Creek and a section through Burney, is on entirely new location. The length of new construction, including bridges, is 19.1 miles. The length via the old road is 23.3 miles, or a saving in distance of 4.2 miles. The cost of construction of this new section of State highway, including bridges at Hat Creek, Pit River and Fall River was $696,000.

On the section from Canyon Creek, west of Burney, to Hat Creek Summit, a distance of 10.2 miles, M. Fredericksen was resident engineer.

On the section from Hat Creek Summit to Fall River Mills, Frank Russell was the resident engineer. This section, including bridges, is 8.9 miles in length. The bridges at Hat Creek, Pit River and Fall River were constructed under two contracts and A. L. Richardson was the resident engineer.

Work was under way on the two road contracts and on the two bridge contracts at the same time, and employment so furnished helped to alleviate the unemployment situation at a time when such help was most needed.

REPAIRING COAST HIGHWAY SECTOR

On the Coast Highway between San Luis Obispo and Pismo, the oil macadam portions of the road, about 1.9 miles in length, are being reconstructed with a 20-foot cement concrete pavement. This project comes under the provisions of the National Industrial Recovery Act of 1933 and will be completed about the first of March.

A man is something that can see pretty ankles three blocks away while driving a motor car in a crowded city street, but will fail to notice, in the wide open countryside, the approach of a locomotive the size of a schoolhouse and accompanied by a flock of forty-two box cars.—*The Borrow Pit.*

State-wide Traffic Survey to Continue in April and July

THE most sweeping and thorough traffic survey ever attempted in California is to be initiated this year by the State Department of Public Works.

With establishment of twelve hundred stations throughout the State, Earl Lee Kelly, Director of Public Works, announces plans to obtain the most comprehensive analysis of automobile and road needs. This work will be undertaken during the months of January, April and July.

In addition, a survey will be started to determine:

1. Total mileage traveled on California highways in the year.
2. Mileage per gallon of gasoline.
3. Types of vehicles driven.

This analysis was made January 14th and 15th with assistance of both northern and southern automobile clubs and the State Chamber of Commerce. Twenty typical locations where the clubs and the State Motor Vehicle Department are issuing license plates were selected in counties through which pass 89 per cent of the total auto registration of California.

The counts for this month, as well as for April and July, will, it may be noted, be scheduled for Sundays and Mondays close to the middle of these months and will be conducted from six o'clock in the morning until ten o'clock at night.

San Francisco, Berkeley, Oakland and Alameda will carry on the work in the cities under State supervision, using CWA workers selected from projects now under way. Captain Macauley, Director of the CWA, has approved the principle of conducting such a state-wide survey with CWA workers, providing it is made a separate project and does not increase the quota now allocated to the respective counties. In other sections of the State, the Department of Public Works will conduct the survey with its regular maintenance crews.

The following cities will have a station to approximately every two thousand inhabitants:

Alameda
Auburn
Bakersfield
Berkeley
Chico
Colusa
Crescent City
El Centro
Eureka
Fresno
Glendale
Huntington Park
Inglewood
Hanford
Long Beach
Los Angeles
Marysville
Modesto
Needles
Oakland
Orange
Palo Alto
Pasadena
Pomona
Red Bluff
Redding
Redlands
Richmond
Riverside
Sacramento
Salinas
San Bernardino
San Diego
San Francisco
San Jose
San Luis Obispo
Santa Ana
Santa Barbara
Santa Cruz
Santa Monica
Santa Rosa
South Gate
Stockton
Susanville
Ukiah
Vallejo
Ventura
Visalia
Whittier
Woodland

CARRYING ON THE HIGH TRADITIONS OF THE SERVICE

Trona, San Bernardino County,
California, December 13, 1933.

Mr. Harry Hopkins,
State Highway Commissioner,
Taft, California.

Dear Sir:

I am taking this occasion to write you of the great courtesy I received at the hands of your superintendent in District No. 6 on the highway between Kern County Park and Glenville December 8th.

I skidded on some snow while rounding a curve and my old Cadillac and I went over the bank together. No one was hurt and the car was not damaged but I was wondering where I would spend the night. Your superintendent came along pretty soon and in a very few minutes he had a tractor there which promptly pulled me back up the bank onto the highway. I was not delayed more than twenty minutes by the mishap. I was very grateful, I assure you for the service of the super and his crew. Not knowing who they were nor why they were so courteous, I took out a roll of bills and asked how much I owed for such prompt and efficient aid. They refused the money which I would have been happy to have paid them and all my urging was useless. The boss said, "No, we do this kind of work every day for someone and it is part of our job."

And so Mr. Commissioner, we have here a splendid example of what Public Service can be when the right type of men are on the job. I wish to commend the Superintendent of District No. 6 and his fine crew and respectfully call your attention to the fine quality of service the public is receiving far up there in the snow-covered Greenhorn Mountains where men are men and where great services are rendered with no thought of accepting money from those benefited. Such men uphold the highest traditions in our beloved California and renew and rekindle our faith in public servants.

Respectfully yours

GEO. P. BEAUCHAMP.

Highway Bids and Awards

FOR DECEMBER

ALAMEDA COUNTY—East Bay Approach, San Francisco-Oakland Bay Bridge, between the westerly end of Key Mole fill and foot of Folger Avenue in Berkeley, District IV, about 4.1 miles to be graded by dredging and placing selected dredger material fill. San Francisco Bridge Co., San Francisco, $962,-685. Contract awarded to American Dredging Co., San Francisco, $869,063.

ALAMEDA COUNTY—East Bay Approach, San Francisco-Oakland Bay Bridge, between westerly end of Key Mole fill and foot of Folger Avenue in Berkeley, District IV, about 4.1 miles rock retaining wall and miscellaneous riprap to be placed. Healy-Tibbitts Construction Co., San Francisco, $286,282; Heafey-Moore Co., and J. A. Casson, Oakland, $341,601; MacDonald & Kahn Company, Ltd., San Francisco, $351,-620. Contract awarded to Fredrickson & Watson Construction Co., Fredrickson Bros., Basalt Rock Company, Inc., Oakland, $274,687.

HUMBOLDT COUNTY—Reinforced concrete girder bridge across Dean Creek about 5 miles north of Garberville, consisting of three 44-foot spans with concrete piers and abutments. District I, Route 1, Section B. Mittry Brothers, Los Angeles, $11,464; F. J. Maurer & Son, Inc., Eureka, $13,930; John Carcano, San Rafael, $12,742; J. W. Halterman, Willows, $13,954; Baldwin & Butler, Berkeley, $11,774. Contract awarded to Theodor Johanns, San Francisco, $10,985.

HUMBOLDT COUNTY—Between Smith Point and Twin Tree Bridge, 0.7 of a mile to be graded and surfaced with screened gravel. District I, Route 1, Section A. Mittry Bros. Const. Co., Los Angeles, $35,397; Harris Bros., Sacramento, $39,427; Mercer-Fraser Co., Eureka, $54,894. Contract awarded to Hemstreet & Bell, Marysville, $32,238.50.

INYO COUNTY—Between Doughertys Corner and Birchim Canyon, about 5.8 miles to be graded and surfaced with bituminous treated selected surfacing material. District IX, Route 23, Sections D, E, F. Hemstreet & Bell, Marysville, $131,120. Contract awarded to Basich Brothers, Torrance, $128,963.

KERN COUNTY—Six timber bridges between junction Route 140 and junction Route 58, about 494 feet. District VI, Route 139, Section A. C. Bongiovanni Construction Co., Hollywood, $32,590; Macco Construction Co., Clearwater, $28,705; R. R. Bishop, Long Beach, $27,438; F. O. Bohnett, Campbell, $27,826; Geo. K. Thompson, Los Angeles, $29,215; M. B. McGowan, Inc., San Francisco, $28,551; Byerts & Dunn, Los Angeles, $28,451; Alfred H. Vogt Company, Inc., San Francisco, $31,400. Contract awarded to Parish Bros., Los Angeles, $26,344.

LAKE COUNTY—Between Middletown and Putah Creek, about 4.6 miles to be graded and surfaced with crusher run base and bituminous treated crushed gravel or stone surfacing. District I, Route 49, Section A. von der Hellen & Pierson, Castaic, $147,589; Hemstreet & Bell, Marysville, $130,066; Peninsula Paving Co., San Francisco, $137,158; A. Teichert & Son, Inc., Sacramento, $148,242; Heafey-Moore Co., Oakland, $149,482; Eaton & Smith and A. J. Grier, San Francisco, $154,342; Larsen Bros. and Hein Bros. Basalt Rock Co., Petaluma, $146,347; Hanrahan Co., San Francisco, $138,934. Contract awarded to Fredrickson & Watson Construction Co.-Fredrickson Bros., Oakland, $122,398.

LAKE COUNTY—Reinforced concrete bridge across St. Helena Creek, near Middletown, consisting of six 31-foot spans on concrete piers with steel pile foundations and concrete abutments with wing walls. District I, Route 49, Section A. Fredrickson & Watson Const. Co., Oakland, $20,386; F. C. Amoroso & Sons, San Francisco, $27,758; M. B. McGowan, Inc., San Francisco, $19,876; Baldwin & Butler, Berkeley, $21,-245; J. W. Halterman, Willows, $20,653. Contract awarded to Thos. J. Doyle, San Francisco, $16,757.

LOS ANGELES COUNTY—In Los Angeles City, between State and Fickett streets, 0.6 of a mile to be graded and paved with Portland cement concrete. District VII, Route 26, Sections L. A. Southern Calif. Roads Co., Los Angeles, $83,077; Oswald Bros., Los Angeles, $125,343; Griffith Co., Los Angeles, $86,109. Contract awarded to Byerts & Dunn, Los Angeles, $77,486.

LOS ANGELES COUNTY—Between Olive View and Tunnel Station, about 3.5 miles to be graded and paved with Portland cement concrete. District VII, Route 157, Sections L.A. Sharp & Fellows Contracting Co., Los Angeles, $275,859; P. J. Akmadzich, Los Angeles, $274,334; Griffith Co., Los Angeles, $220,673; Jahn & Bressi Construction Company, Inc., Los Angeles, $217,664. Contract awarded to J. L. McClain, Los Angeles, $216,962.

LOS ANGELES COUNTY—Between Evergreen Avenue and Atlantic Boulevard, about 3.8 miles to be graded and paved with Portland cement concrete and asphalt concrete. District VII, Route 26, Section D. Griffith Company, Los Angeles, $319,894; J. E. Haddock, Ltd., Pasadena, $303,819; Sander Pearson, Santa Monica, $326,761; Oswald Bros., Los Angeles, $314,929; United Concrete Pipe Corp., $362,900. Contract awarded to Jahn & Bressi, Los Angeles, $299,-644.25.

LOS ANGELES COUNTY—Between Central Avenue & Alameda Street in Graham, 1.5 miles paved with asphalt concrete. District VII, Route 174, Section B. United Concrete Pipe Corp., Los Angeles, $166,673; Oswald Brothers, Los Angeles, $142,779; P. J. Akmadzich, Los Angeles, $164,443; Southern California Roads Co., Los Angeles, $130,941. Contract awarded to Griffith Company, Los Angeles, $129,445.50.

MONTEREY COUNTY—Between Big Sur and 1.6 of a mile south of Molera's Ranch, 3.1 miles to be graded. District V. Route 56, Section F. M. J. Bevanda, Stockton, $162,277; Larsen Bros., Sacramento, $157,676; S. H. Palmer, San Francisco, $170,-913; Hanrahan Co., San Francisco, $191,182; Union Paving Co., San Francisco, $171,985; Hemstreet & Bell, Marysville, $154,799. Contract awarded to Force Construction Co., Piedmont, $136,965.55.

MONTEREY COUNTY—Three timber bridges 45 and 49 miles south of Monterey, across Anderson Canyon consisting one 76-foot span and twenty 19-foot stringer spans; across Buck Creek, one 57-foot span and fourteen 19-foot stringer spans; across Lime Creek, ten 19-foot stringer spans. District V. Route 56, Section D.E. W. J. Tobin, Oakland, $89,816; G. K. Thompson, Los Angeles, $80,534; Eaton & Smith & Grier, San Francisco, $79,983; Theo. M. Maino, San Luis Obispo, $92,136; R. H. Travers, Los Angeles, $98,754; Lynch-Cannon, Los Angeles, $96,495; Lindgren & Swinerton, San Francisco, $86,376; M. B. McGowan, Inc., San Francisco, $81,968; F. O. Bonnett & N. M. Ball, Berkeley, $84,800. Contract awarded to Bodenhamer Construction Co., Oakland, $78,096.

ORANGE COUNTY—Steel stringer bridge with concrete deck consisting of eight 47-foot spans on concrete piers and abutments with pile fenders, across Santa Ana River at Buaro Street. District VII. Herbert M. Baruch Corporation, Ltd., Los Angeles, $43,944; R. R. Bishop, Long Beach, $42,168; Silveria & Robbins, Ventura, $42,511; Sharp & Fellows Contracting Co., Los Angeles, $44,302; David J. Reed and Joseph Maiser, Los Angeles, $49,063; Byerts & Dunn, Los Angeles, $42,139. Contract awarded to Franklin B. Gridley, Pasadena, $41,832.

PLUMAS COUNTY—Steel stringer bridge with concrete deck across Yellow Creek about 2 miles west of Howells consisting of one 50-foot span, one 44-foot span and two 32-foot spans on concrete piers and abutments. District II, Route 21, Section A. Contract awarded to E. T. Lesure, Oakland, $18,462.

SAN BERNARDINO COUNTY—Between westerly boundary and Camp Cajon, about 15.1 miles to be graded and treated with fuel oil and bituminous surface treatment applied. District VIII, Route 59, Section A. Basich Bros. and John Jurkovich, Torrance, $147,137; Macco Construction Co., Clearwater, $165,-203; Gist & Bell, Arcadia, $184,444; Griffith Co., Los Angeles, $176,564; J. E. Haddock, Pasadena, $170,906; Isbell Construction Co., Carson City, Nevada, $187,540; C. G. Willis & Sons, Inc., Chas. G. Willis & Crow Bros., Los Angeles, $160,355; M. J. Bevanda, Stockton, $155,-863; Geo. K. Thompson, Los Angeles, $158,356. Con-

State Highway Bids and Awards for the Month of December

(Continued from preceding page)

tract awarded to Sharp & Fellows Contracting Co., Los Angeles, $146,975.

SAN BERNARDINO COUNTY—Between Pomona and Ontario, 2.1 miles graded and paved with asphalt concrete. District VIII, Route 26, Section C. United Concrete Pipe Corporation, Los Angeles, $57,304; Oswald Bros., Los Angeles, $57,753; Imperial Rock Corp. & Orange County Rock Co., Los Angeles, $76,908. Contract awarded to Griffith Company, Los Angeles, $57,207.70.

SANTA CRUZ COUNTY—Between north city limits and Ocean Street, in Santa Cruz, about 0.6 mile to be graded, surfaced with crusher run base and bituminous surfacing. District IV, Route 5, Section A. Granite Construction Company, Ltd., Watsonville, $43,929; J. L. Conner and K. Kristich, Monterey, $45,982; Biasotti, Willard & Biasotti, Stockton, $48,967; Kennedy Construction Co., Oakland, $54,393; Mittry Bros. Construction Co., Los Angeles, $50,312. Contract awarded to Union Paving Co., San Francisco, $43,620.

STANISLAUS COUNTY—At Modesto, 1.3 miles to be paved with asphalt concrete. District X, Route 4, Section B. Biasotti, Willard & Biasotti, Stockton, $71,867; Valley Paving & Construction, Fresno, $59,918; A. Teichert & Son, Sacramento, $66,051. Contract awarded to Heafey-Moore Co., Oakland, $57,774.

TEHAMA COUNTY—At Red Bluff about 0.8 of a mile to be graded and paved with Portland cement concrete and bituminous treated crushed gravel or stone surfacing. Dist. II, Rt. 3, Section C. M. J. Bevanda, Stockton, $57,070; J. P. Brennan, Redding, $48,769; A. Teichert & Son, Sacramento, $48,766. Contract awarded to Hein Bros. Basalt Rock Co., Petaluma, $46,771.47.

TRINITY COUNTY—Between 1.8 miles west of Burnt Ranch and McDonald Creek, 2.3 miles to be graded and oil treated. District I, Route 20, Section C.D. von der Hellen & Pierson, Castaic, $112,004; Contoules Const. Co., San Francisco, $113,307. Contract awarded to Hemstreet & Bell, Marysville, $111,523.95.

AUTOMOBILE PRODUCTION IN 1933 SHOWS 43 PER CENT INCREASE

Production of motor vehicles in the United States and Canada in 1933 increased 43 per cent over 1932, with foreign sales showing 29 per cent improvement over the previous year's figures, it is reported in preliminary computations from the National Automobile Chamber of Commerce. The report shows that the United States has 72 per cent of the world's automobiles and 3,040,000 miles of highways, of which 920,000 miles are surfaced.

According to the record, the automobile industry last year consumed 85 per cent of the nation's gasoline supply, 80 per cent of the rubber, 59 per cent of the lubricants, 38 per cent of the plate glass, 28 per cent of the nickel, 25 per cent of the aluminum, 15 per cent of the steel and iron, 14 per cent of the lumber and hardwood, 11 per cent of the copper, and 10 per cent of the lead. Cotton fabric used in manufacturing tires totaled 185,000,000 pounds.

A Scotsman on a visit to a friend in London outstayed his welcome. His host thought a hint might have the desired result.

"Don't you think," he asked, "that your wife and family will want you to be with them?"

"Mon," replied the Aberdonian, "I believe you're richt. It's rale thoctful o' you. I'll just send for them."—*Rotary Reminder.*

New Applications to Build Dams Show Increase for Month

(Continued from page 23)

which have been received during the past month, it is to be expected a number of applications for approval of plans and specifications for construction of dams will be filed shortly. Probably a large part of the activity is due to the opportunities afforded for financing projects under Federal aid, although some of the activity, particularly in debris dams, undoubtedly arises from the advance in the price of newly mined gold.

FEDERAL COOPERATION

Cooperative Topographic Mapping.

It is hoped to obtain some assistance to the general topographic mapping program through cooperation of the Civil Works Administration, which has made $60,000 available to the Coast and Geodetic Survey. It is anticipated that a portion of this money at least will be made available in the extension of horizontal and vertical controls which will later be useful to the Geological Survey in its topographic mapping program.

WATER RESOURCES

The Central Valley Project Act, which authorizes the construction of the initial units of this plan, was approved by the people at the special election on Tuesday, December 19, 1933, by a majority of approximately 30,000 votes. The Secretary of State estimates that the canvass of the vote will be completed and the official declaration thereof made by him in time to make the act effective sometime between January 10 and January 15, 1934.

MORRO BAY-ATASCADERO RECONSTRUCTION PLANNED

Plans are in progress for the reconstruction of approximately five miles of the road from Morro Bay easterly toward Atascadero. This road is a portion of State Route No. 125 between Morro Bay and Fresno that was included in the secondary roads taken over from the county by an act of the recent Legislature. This project will come under the provisions of the National Industrial Recovery Act of 1933.

LINE CHANGES AT ELWOOD

On the Coast Highway at Elwood a change of line, including the approaches to the new bridge over the Southern Pacific tracks, is under construction with a 20-foot cement concrete pavement on a 36-foot graded roadbed. The project comes under the provisions of the National Industrial Recovery Act of 1933 and will be completed in February.

Joyous Cavalcade of Cars Participates in Highway Dedication

(Continued from page 6)

California Highway Commission; Philip A. Stanton, Timothy A. Reardon and Frank A. Tetley, members of the Commission.

Other notables present included General Ortiz Rubio, past president of Mexico; Assemblymen George B. Bowers, Bruce R. Stannard and Charles W. Stream; Admiral William T. Terrant, U. S. N., Commandant of the 11th Naval District; Tom Hurley, chairman, board of supervisors of San Diego County; city and county officials and representatives of the Chamber of Commerce and civic organizations.

A DREAM FULFILLED

Mayor John Forward, Jr., presiding at the dedication ceremonies opened the program by introducing the Navy band which furnished music for the occasion.

"For years the city has sought an entrance in keeping with the natural beauty of San Diego," said Mayor Forward. "First it was a dream—then it became a necessity. Now we have it and we hope the city will be able to beautify it until it becomes unique."

The mayor paid tribute to the successful efforts of the State Board of Public Works, State Highway Commission, State Park Department and many local organizations and citizens in making the dream come true.

Director Kelly described the highway as one of the finest in California and a splendid auxiliary to Lindberg Field. "The State is seriously considering your needs along El Cajon Boulevard and on the Point Loma road," he said.

PRESIDENT WILL SEE IT

"Congratulations—I hope to have President Roosevelt rolling over this road when Congress adjourns," wired Congressman George Burnham.

Harry A. Hopkins, Chairman of the Highway Commission, spoke of the difficulties overcome in construction of the boulevard, and brief addresses were made by Commissioners Reardon, Stanton and Tetley.

Other speakers included Supervisor Tom Hurley, Frank Forward, chairman of the Chamber of Commerce Road Committee, and Assemblymen Bowers, Stannard and Stream.

At the conclusion of the program a caravan of several hundred automobiles, three abreast, a colorful, jubilant cavalcade, swept along the new boulevard around the curving bayshore to the scene of the ribbon-cutting ceremony at the foot of Rose Canyon, at Balboa Street, Pacific Beach.

KELLY DEDICATES ROAD

After a few words by Mayor Forward, Director of Public Works Kelly's scissors snipped the ribbon barrier as he dedicated the new highway "To the service of the people of California and our visitors."

The last unit of this "million dollar" highway to be completed was the bridge over the San Diego River. This deck plate girder bridge, with concrete deck, consists of eight 80-foot spans on concrete piers and abutments with pile foundations, making a total over all length of 641 feet and having an elevation of 20 feet above the stream bed.

The bridge provides a clear roadway width of 40 feet, and two 4-foot sidewalks. All spans are carried on reinforced concrete hollow piers resting on concrete footings 11 feet 6 inches by 45 feet 3 inches, which in turn rest on 62 untreated Douglas fir piles. The base of the piers is carried 20 feet below the bed line. End abutments rest on 16 reinforced concrete piles 20 feet in length.

Piles for the outer piers in the stream line of the river had to be extended 20 feet in length on account of quicksand. Construction of these piers, owing to subterranean flow of the river, presented some difficult subaqueous problems. Contract for this bridge was awarded February 27, 1933.

TABLE OF COMPARATIVE ACCIDENT HISTORY OF 2, 3 AND 4 LANE HIGHWAYS

The following tabulation showing the relation of accidents to number of highway lanes was made by Clarence P. Taylor, Traffic Engineer, State Department of Public Works, Mass., revealing the superiority in safety of the four-lane type. Intersection accidents and accidents to pedestrians are not included.

Number of Lanes	2	3	4
Number of highway links considered	6	8	3
Total mileage involved	150.7	108.4	25.4
Average annual traffic volume — millions of vehicles	2.18	2.49	6.02
Total number of accidents in one year	450	379	144
Rate of accidents per mile	2.99	3.49	5.67
True accident index—accidents per million vehicle miles	1.37	1.40	0.94

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Department of Public Works

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EARL LEE KELLY----------Director

ERIC CULLENWARD----------Deputy Director

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FRANK A. TETLEY, Riverside
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Port of San Jose—Not appointed

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STATE OF CALIFORNIA
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MAP
SHOWING
STATE HIGHWAY SYSTEM
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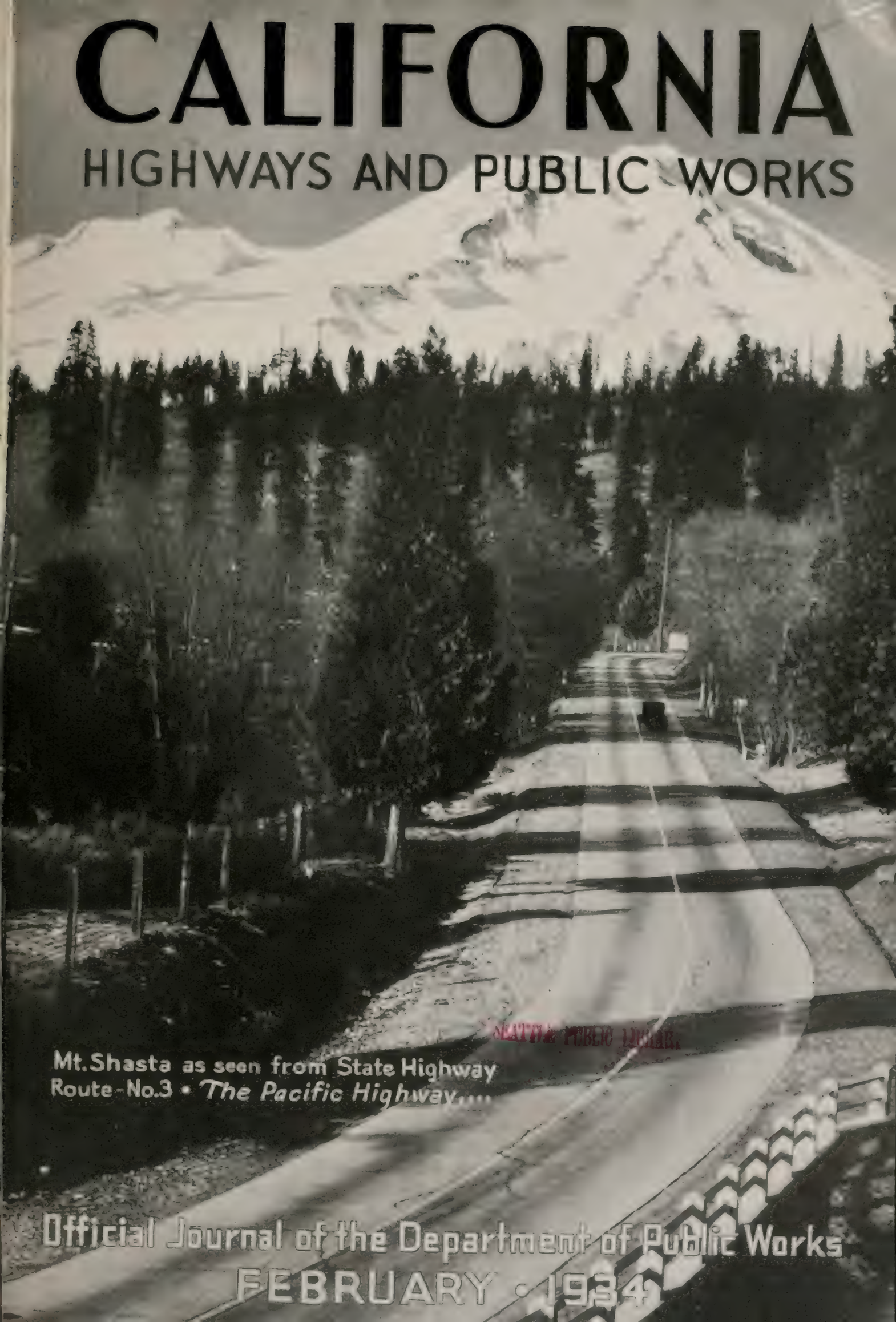

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Mt. Shasta as seen from State Highway Route No. 3 • *The Pacific Highway*....

Official Journal of the Department of Public Works

FEBRUARY · 1934

FEB 27 1934

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Congress Urged to Renew $125,000,000 Annual Federal Aid for Highways

Unless Granted, California Faces Necessity of Eliminating Budget Projects Owing to Rising Costs of Materials, Increased Maintenance and Relief Employment, Says Commission Head

By **HARRY A. HOPKINS,** Chairman, California Highway Commission

THERE has been introduced in the Seventy-third Congress by Mr. Hayden of Arizona a bill providing for Federal Aid to the States in the sum of $125,000,000 for the fiscal year ending June 30, 1935, and the same amount for the fiscal year ending June 30, 1936. The bill provides for other appropriations of $12,500,000 for the same periods for forest highways, roads and trails as well as sums for roads in Reservations, Parks, etc.

It behooves the people of California to use every influence at their command toward urging the present Congress to act favorably on this bill.

How much is $125,000,000? In terms of the NRA, PWA and CWA we find it a sum placed in the lower brackets of the vast amounts of money the Federal Government is providing to keep the wheels of progress moving and bring back a normal condition to the country. To the layman the vast sums of money appropriated and expended by the cities, counties, States and Federal Government are far beyond his conception and yet appropriations by our government reach such large figures that all of us could honestly admit we are acting the part of little "Alice in Wonderland."

HARRY A. HOPKINS

In all our modern civilization there never was a period like the present. In all the history of the world chronicling the operations of governments through the ages the storehouses of Montezuma, the vaults of ancient Rome, or even the fabulous caves of Aladdin, never held such wealth as we now find being spent in the interests of humanity and the future security of this nation. And through all the necessary hurrying and scurrying to accomplish something; the setting up of tremendously large dispersing organizations, bringing into action the brains of the country through efficiency experts, technical advisers and financial wizards, there stands forth—I won't say tranquil and serene but steadfast in their purpose—a group of citizens who are engaged in the largest activity tending towards the relief of human distress and the making of permanent investments that have in the past, and will continue to have a very necessary part in the social and economic life of the people and probably mold their future destinies. This

(Continued on page 10)

State Highways Defy Worst Flood in 50 Years—$270,000 Damage in 1070 Miles

By **R. C. MYERS,** Assistant Engineer, District VII

FROM December 28, 1933, to January 2, 1934, Los Angeles and the adjacent foothill area was visited by the heaviest rainfall within the memory of the oldest resident. Starting with a steady downpour on December 28th the precipitation increased in volume until on New Year's Eve it reached and maintained the intensity of a cloudburst for several hours in succession.

Approximately fourteen inches of rain fell within fifty hours, whereas the total normal rainfall for the entire season is about fifteen inches.

In the mountainous area northerly of the suburban towns of La Crescenta, Tujunga, La Canada, Montrose and Glendale, a brush fire last fall had burned over and denuded about three thousand acres of steep hillside country from which the most intense run-off occurred. An avalanche of water, silt, boulders and debris swept across Foothill Boulevard from each of five canyons, leaving a path of desolation and destruction through the town of Montrose and the adjoining territory.

VAST SHEET EROSION

In this vicinity alone 363 houses were totally ruined and 478 so badly damaged that it is doubtful if they can be repaired. Flood control engineers estimated that the sheet erosion was approximately 50,000 cubic yards of material per square mile over the burned-off area in the watersheds of Cooks Canyon, Dunsmuir Canyon, Shields-Eagle-Goss Canyon, Pickens Canyon and Halls Canyon.

Although the precipitation was equally intense in the watershed of Haines Canyon, just westerly of these five canyons, the run-off was much less. Easterly of Haines Canyon the watershed had been denuded by fire but the debris basin at the mouth of the canyon protected the densely settled Tujunga district from destruction of life and property such as occurred in the Montrose area.

Water from these canyons north of Foothill Boulevard converged in Verdugo Wash in the Montrose area and that normally dry creek bed temporarily became a river more than 100 feet wide and 15 feet deep. So great was this torrent that bridges which had stood through the heaviest storms for a great many years past were swept away like so much straw. One of these bridges lodged against the Southern Pacific Railroad bridge near Glendale, placing the main line of the Southern Pacific out of commission for more than one week.

$5,000,000 PROPERTY DAMAGE

Los Angeles River, ordinarily a dry stream bed, fed by a number of tributaries during this storm and particularly by the immense rush of water from Verdugo Wash, was changed into a torrent which cut deeply into the banks and revetment work on each side, doing heavy damage.

Press accounts indicate that more than $5,000,000 in property damage resulted from this storm and other reports are that upwards of 50 people lost their lives, either directly by drowning or indirectly through exposure caused from the flood.

Governor Rolph, on receiving reports of the disaster, rushed to Los Angeles by airplane and made a tour of inspection of the devastated areas of Glendale, La Crescenta, Montrose and Tujunga. This personal trip of inspection was made in order that the Governor could learn first-hand the actual conditions in the stricken area. Both on January 2d and 3d Governor Rolph toured this area, collecting as rapidly as possible information which would guide him in the State relief and rehabilitation work which he promptly inaugurated.

PROMPT AID BY GOVERNOR

It was with great difficulty that the gubernatorial party made its way through the stricken area on account of washed-out bridges, pavements covered with silt and boulders, and the debris which blocked traffic at nearly every point. On obtaining first-hand a complete picture of the destruction wrought, the Governor pledged the full resources of the State government in men and equipment to aid the stricken area.

Earl Lee Kelly, Director of Public Works, was put in direct charge of the State's relief

(Continued on page 14)

Havoc Wrought by Wild Torrents

BOUNCING BOULDERS weighing 15 to 25 tons hurtled down the hillsides of the Montrose area during the Los Angeles County flood and were deposited with 25,000 cubic yards of silt and debris on the Foothill Boulevard as shown in pictures 1 and 2. No. 3—Maintenance station at La Crescenta practically demolished. No. 4—Wreckage of superintendent's cottage. No. 5—Foothill Boulevard at Pickens Wash culvert. No. 6—Wrecked bridge on Garvey Avenue.

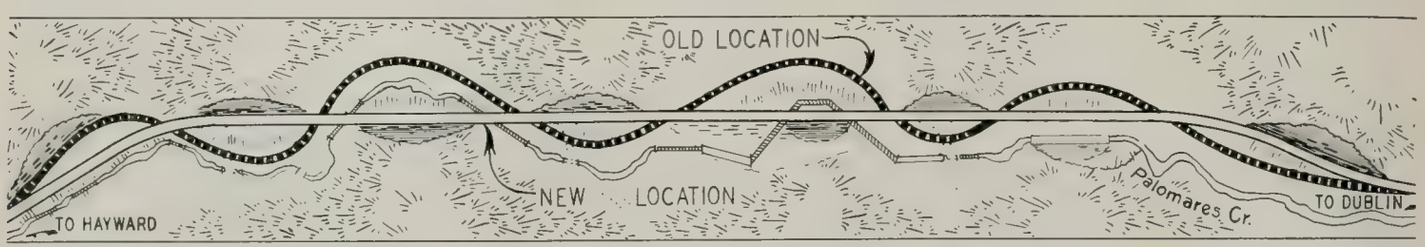
Dublin Canyon Multi-Lane Arterial An Outstanding Highway Achievement

By **JNO. H. SKEGGS,** District Engineer, District IV

ONE of the most important State highways connecting the great Bay Region with the inland is that known locally as the "Dublin Canyon Road." Thousands traverse it daily between the bay cities and the San Joaquin Valley; and many who have passed that way have recently asked us the question "Where is Dublin Canyon?"

Dublin Canyon is one of the few passes favorable for highways through the chain of hills separating the populous centers about the bay from the San Joaquin Valley, and it cuts directly through the chain from Castro Valley, near Hayward, to the little town of Dublin at the edge of Livermore Valley—a wing of the San Joaquin.

The Dublin Canyon Road is a link in the State Highway Route Number 5 from Oakland to the great State Highway Route Number 4 traversing the middle empire between Sacramento and Los Angeles.



THE OLD ROAD made a snake's trail through Dublin Canyon

MULTI-LANE PAVEMENT

This link is 6.7 miles long. It is graded to a width of 46 feet. It is paved to a width of 40 feet with Portland cement concrete to the summit of the grade leading out of Castro Valley. Thence on to Dublin the pavement is 30 feet wide in Portland cement concrete excepting certain sections which were paved with an intermediate type of bituminous surfacing for economy in restorations after any shrinkage produced by fill settlement.

The maximum grade rate is 6 per cent and only 13 per cent of total distance is at this rate. The highest and lowest elevations reached are respectively 750 feet and 296 feet. In the entire 6.7 miles there are 16 curves with a total of but 376° 39′ curvature as against 998° 02′ curvature on the old alignment. The sharpest curve has a radius of 1000 feet as compared with 500 feet on old line. The sharpest summits provide clear sight distance of 600 feet or more. Shoulders are covered with oil treated crushed rock and protected with substantial berms or guard rail.

The new alignment does away with all bridges, and makes the necessary traveled distance three-tenths mile shorter than the line it displaced.

Traffic, even through the depression years, has grown to great volume and comprises a large number of heavy freighting units.

SAVINGS EXCEED INVESTMENT

On a basis of capital values the recent improvement shows savings in road service more than sufficient to pay the construction costs of this latest improvement, which amounted to $386,578.

Preliminary studies compared the costs of improving along the present line by cutting back the points on blind curves. These curves were so numerous and the reverses so sharp that the volume of earth to be moved was greater than that involved in reconstructing the road along the comparatively straight lines as adopted. This feature of the analysis is clearly brought out in the pictures which show the road as built, and in the sketch representing the new location in relation to the old.

With a summer traffic running over 9000 cars on Sundays and 5000 cars on week days; and in winter over 6000 cars on Sundays and 4000 on week days it is obvious that the new location provides safety and convenience for such heavy traffic that would be impossible to secure by any practical improvement along

(Continued on page 19)

STRAIGHT THROUGH THE HILLS runs the new, shorter Dublin Canyon Boulevard on a high standard of alignment with a minimum of curves and a maximum of sight distance and 6 per cent grade. No. 1—General view of three-lane highway through central part of canyon showing elimination of many curves. Nos. 2 and 3—Comparative views of new and old highway taken at same location. Below—The broad curve on Castro Hill with three lanes widening to four-lane 40-foot pavement.

Mileage Equaling Six Transcontinental Highways Built by Public Works Funds

CONSTRUCTION actually has been undertaken in the last six months under the Federal Public Works appropriation on a road mileage sufficient to build six great transcontinental highways across the United States. This striking comparison was made by Thos. H. MacDonald, Chief of the Bureau of Public Roads, U. S. Department of Agriculture, which has the highway building in charge, in addressing the thirty-first annual convention of the American Road Builders' Association recently held in Chicago.

"For those who desire a wide highway from coast to coast, if the six lines equivalent to the last six months of nation-wide road building were brought together in one great highway, construction would now be under way to provide a surfacing upwards of 110 feet wide on a roadbed about 200 feet wide over a right of way 400 feet wide," declared Mr. MacDonald.

"Or if a highway from the United States to the Panama Canal is wanted, the highway construction now in progress is equivalent to six first-class highways to span the 3000 miles distance. Assuming that the program continues in the same proportion, this single program will produce a mileage equal to a highway around the world.

WORK WIDELY DISTRIBUTED

"Actually, this work has not been concentrated upon any single line or class of highways, but has been distributed widely to reach into nearly every county of every State," he continued. "There are included mileages of both secondary or farm roads as well as municipal streets which are a part of important highway routes, thus distributing work where work is needed to reduce unemployment. This would not be accomplished easily by a single line construction.

"The previous principle of the Federal highway legislation to hold the Federal appropriations on a limited system of highways was modified by the new Public Works Law to permit the improvement of the major routes into and through the municipalities. While this slowed down the immediate beginning of the work, because of projecting the highway departments into an almost entirely new field, it does place the construction work in the vicinity of greatest need for employment, and has the advantage of not dislocating labor from its established environment.

DIFFICULTIES INCREASED

"This work is also directed toward the improvement of unquestionably one of the worst conditions affecting traffic that now exists, and the bureau is very much in sympathy with the work in the municipalities, although it has increased the difficulties of administration both for the State highway departments and for the bureau.

"Out of this program, however, will come some notable improvements in traffic conditions all over the country, and when the depression shall have passed there will remain tangible benefits more than justifying the expenditures. Also, the use of Federal funds for the improvement of secondary roads has brought opportunities for employment most seriously needed and is leaving behind facilities amply justifying the expenditures.

"Another principle that has been emphasized is that of more adequate rights of way and intelligent and extensive landscaping consistent with the purposes of the utility which is being provided.

BEAUTIFICATION NEGLECTED

"Roadside improvement has been too long neglected. While there may be those who are reluctant to undertake any considerable amount of this work until we shall have more adequately improved the roadways themselves, an analysis of the necessary cost of more beautiful highways will not support a longer deferment of this type of work. The bureau is not only in sympathy with this character of improvement but is a very insistent exponent.

"It has long been recognized that the social and recreational use of the highways accounts for a large part of the traffic upon them. Complete analysis of the taxes and imposts indicates that highway users are paying heavily for their privileges.

Cities Present Worst of Traffic Conditions Says U. S. Road Chief

(Continued from preceding page)

"The total income from all kinds of taxes paid in 1932 by highway users approximated $1,000,000,000.

"As a matter of simple fairness the highway user should not be denied appropriate roadside improvements generally. The selfish interest of the road builder who desires to increase the highway earnings, should prompt him to provide attractive highways that will lead to their greater use.

MUST MEET COMPETITION

"In the future it will not be sufficient for States to supply good roadways. They will necessarily have to meet the competition of States that are providing beautiful highways."

In summarizing the work undertaken to the end of 1933 on public works highways by the States under the supervision of the Bureau of Public Roads, which covers two-thirds of the program, Mr. MacDonald reported a total of 17,647 miles of construction at an estimated cost of $273,849,184. Of these roads, 9822 miles are on the Federal-aid system outside of municipalities, 964 miles are extension of such roads into and through cities, and 6861 miles are secondary or feeder roads. Included in the new ideas discussed by Mr. MacDonald were the payment for railroad grade crossing eliminations, thereby relieving the railroads of expense heretofore required under State laws, the discouragement of State purchases of Portland cement for highway building and the improvement of secondary roads.

"Hello, Hayseed," said the facetious youth. "How's it for a lift to Centerville?"

He jumped into the car without waiting for an answer.

Twenty minutes passed.

"Quite a distance to Centerville, isn't it?"

Twenty minutes more.

"Say, how far is it to Centerville?"

"Few thousand miles if you go this way; 'bout twenty if you get off and walk back."

It is estimated by the Interstate Commerce Commission that 45,000 of the 125,000 outlying communities of the country, containing one-tenth of the nation's population, are without railroad connections, and rely wholly upon the motor vehicle for transportation.

ROADSIDE BEAUTIFICATION NOW SOUND PUBLIC POLICY

Yet another field is roadside improvement, consisting largely of finishing the roadsides to heal the scars of construction operations by the addition of seeding and well designed planting. A prominent place has been given improvements of this kind in the rules issued for the conduct of the recovery highway program. It is universally recognized that a very large percentage of the total use made of the highways is for recreational and social pursuits. Reasonable expenditures for providing pleasant and beautiful roadsides are wholly consistent with sound public policy. As highway executives, we will fail to realize the changed sentiment if we are longer content to build roadways only and neglect to improve and to plant the roadsides. We can confidently expect that in the near future communities which have been relying upon well improved roadways to attract outside traffic, will be placing greater reliance upon beautiful highways.—*From address of Thomas H. MacDonald, Chief of Bureau of Public Roads.*

Auto Sales in State Increase 36 Per Cent

New car sales throughout California during 1933 increased 36 per cent over the previous year with a total of 110,642 new passenger cars and trucks sold last year as against 81,340 in 1932.

Los Angeles led other principal cities of the State in new passenger car sales during 1933 with a total of 21,624. San Francisco was next with a total of 10,202, and Oakland third with 3845.

New passenger car sales for the 11 counties in southern California totaled 57,349 last year, a 45 per cent increase over the 39,481 total for 1932. Northern California had an increase of 29 per cent.

TRUCKS CARRY 4.2 PER CENT OF COUNTRY'S INLAND TRAFFIC

The Interstate Commerce Commission in its investigation known as Docket No. 23400 found that trucks carry 4.2 per cent of the inland traffic of the country and a volume equal to 6 per cent of the railroad traffic.

If the railroads had all of the competitive truck traffic it would not materially help them in this depression according to Roy F. Britton, Director, National Highway Users Conference.

Redwood Highway Realignment Reduces 32 Curves to 9 on Dangerous Stretch

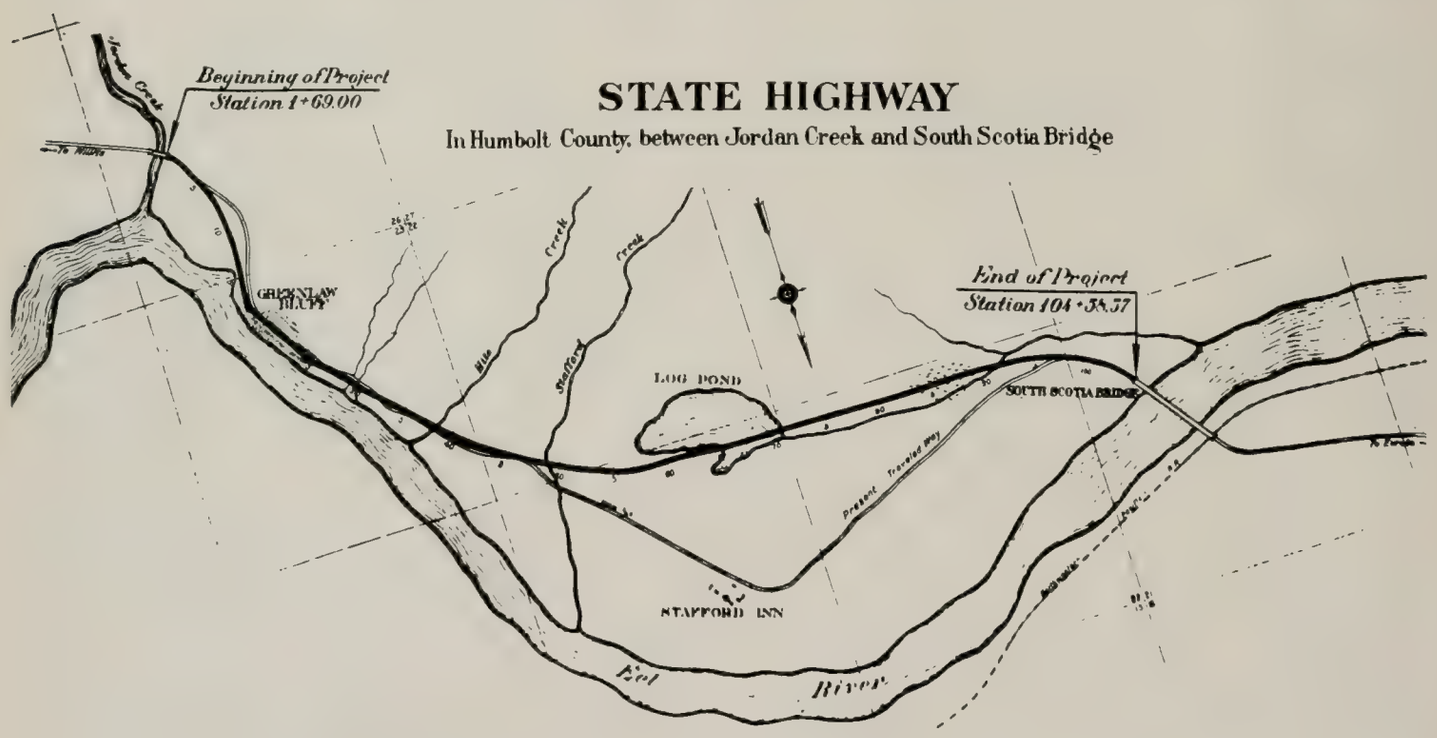
By **E. M. CAMERON,** District Construction Engineer

THE realignment of the State highway between Jordan Creek and South Scotia Bridge in Humboldt County, a distance of 1.9 miles, will eliminate a short stretch of the Redwood Highway which has been a source of worry to the public for many years, due to the poor alignment and narrow roadway both through the cut-over area on the north end of the project, and the 1000-foot stretch of bluff at the south.

At the time of the original location of this stretch of highway, there was being operated a large saw mill on the logical location, and it would have been very expensive to have attempted to purchase right of way through this operating mill. Consequently the road and justifiable requests that the road be reconstructed on the more direct route.

The new construction provides for a minimum roadway width of 30 feet and a minimum radius of 450 feet. The following comparative table indicates in general the difference in alignment and grade between the present road and the proposed improvement:

	Present	Proposed
Minimum radius	100′	450′
Maximum radius	900′	5000′
Total curvature	810°	215°
Number of curves	32	9
Length in miles	2.140	1.946
Maximum grade	5.00%	4.56%



NEW ROAD shown by heavy black line saves 1.94 miles in distance.

was located around the mill and around many of the larger trees, resulting in a very poor alignment as the 32 curves in a distance of 2.1 miles would indicate.

FIRE CLEARED WAY

Several years ago, and soon after all the timber on the flat had been logged off, the mill was completely destroyed by fire. Each year subsequently there have been insistent

While the grading on the cut-over area was very light, the clearing was exceptionally heavy, being a mass of large stumps and fallen logs.

The accompanying pictures give a good idea of the extent of this item, there being eight of such piles of stumps, logs and lumbering debris within a distance of 2500 feet. The new construction also eliminates, to a great extent, another hazard to the public on

(Continued on page 15)

ROUGH GOING for highway builders was encountered on this portion of the Redwood Highway realignment between Jordan Creek and South Scotia Bridge where the debris of old logging days including many huge stumps covered the right of way.

DYNAMITING OPERATIONS were necessary to remove ancient stumps of great redwoods left by the logging crews when the lumber companies were busy in this locality. The stump in the foreground measured over 13 feet in diameter as shown by the 13-foot rod held by the man.

FLAMES LEAPED HIGH when these towering piles of stumps and roots were put to the torch after the clearing operations. There were eight such piles in a distance of 2500 feet.

State Faces Elimination of Projects

(Continued from page 1)

group activity is the building of the nation's highways.

STATES HAVE COMMON INTEREST

The experiences of the States and their political subdivisions have made it apparent to all conversant with highway development that their interests are common. Neither the State nor the political subdivision can divorce from the other this vital part of their government. The States are now so closely allied through our national transportation system that their interests, at least so far as their economic life is concerned, are largely common. The development of our existing highway system throughout the nation has become a necessary factor in the operation of many departments of our Federal Government. As far back as 1916 the Congress recognized the necessity of a national system of transportation lanes for vehicular use and caused financial assistance to be given the States that the requirements of the necessity might be well taken care of.

With the rapid increase in population and the development of new commerce and trade, it is more evident than ever that the Federal Government should continue its assistance and carry out the implied obligation assumed in 1916. In California we find increased population greatly beyond what was prophesied twenty years ago. In 1910 the urban population comprised 61.8 per cent of the total and twenty years later in 1930 it comprised 73.3 per cent.

STATE PROBLEMS INCREASED

In an address by Charles H. Purcell, State Highway Engineer of California, given before the annual meeting of the State Chamber of Commerce on November 9, 1933, in Los Angeles, he made this pertinent statement: "Improved transportation facilities as reflected in improved roads have unquestionably had no small part in this changing ratio which emphasizes the fact that the modern highway system in conjunction with improved modern vehicles has resulted in a much closer relationship of the various political subdivisions of the State, making State problems out of many things that were formerly of local interest only."

Again we find that in the development of the highway system in the State of Nevada, through appropriations of the Federal Government, a pioneer people by constructing the connecting link between Nevada and California, eliminated the last remaining highway barrier between the Atlantic and Pacific oceans.

Through the use of Federal money many of the Western States have been able to keep their rightful relationship, not only with their sister States, but with the very seat of government itself. Without this Federal assistance very few miles of highways could have been constructed in those States with small population and whose area is largely in the public domain.

STATES EXPECTED CONTINUANCE

Congress, through the Federal Aid Bill enacted July 11, 1916, when $5,000,000 was appropriated for the following year, has, up to the present time, paid to the States to apply on the Federal Aid System a total of $1,206,758,841. During 1931 and 1932 there was appropriated of this amount $125,000,000 per year. California had received out of these appropriations to be used in making up our biennium budgets better than $8,000,000. The expectancy of the continuance of this Federal Aid that was engendered in the minds of the legislators of the several States was not brought about through any thought of a rightful heritage, but because the States as good and faithful servants had acted as agents at the request of the government in wisely expending Federal Aid money to cover the requirements of proper transportation facilities for both Federal and State governments.

Federal Aid had become such an important part of the revenue of the States in highway development that the action of the Congress just passed has not only caused California to rewrite its budget but to be placed in a position where the mental faculties of those constructing our highway system will be taxed to the utmost.

MAY ELIMINATE PROJECTS

Rising costs of highway material, increased maintenance cost and the desire to comply with the present Federal Government activity directed towards the relief of unemployment together with the loss of the

Western Conference Urges Federal Aid for Next Biennium

(Continued from preceding page)

expected $8,000,000 as our part of the Federal Aid appropriation may make it necessary to further adjust the budget for the present biennium by the elimination of projects. We sincerely trust other adjustments may be made that will render this latter course unnecessary.

Other States are likewise affected by the loss of revenue expected from the Federal Aid appropriation. Arizona is depending almost exclusively on Federal Aid and is not doing highway work on anything but the Federal Aid System. Montana depends upon Federal Aid money and has no funds for non-Federal Aid roads.

Nevada for the most part depends on the Federal Aid appropriation. Out of 4000 miles on her highway system, 1675 miles are on her Federal Aid roads. Only 600 miles have ever been built with other funds.

New Mexico depends on the Federal Aid System and in this system has 3678 miles. Incidentally 361 miles of them are in the Federal Reservation. At the present time the States of Arkansas, Mississippi and North Carolina are largely depending on Federal Aid and doing most of their present work with CWA funds.

WESTERN CONFERENCE FORMED

Recently there was held in the city of Reno, Nevada, a meeting sponsored by the California State Automobile Association and which organized as the Western Inter-State Highways Conference. Five western States were represented. The most important resolution adopted was a declaration in favor of continued Federal Aid appropriations.

The American Association of State Highway Officials at their annual meeting in Milwaukee in October last year adopted a similar resolution. The Board of Directors of the American Automobile Association held in New York City on January 9th, this year, passed a resolution which in substance favors a continuation of Federal Aid for inter-State highways including the customary special aid for roads through the unappropriated public domain, the forest, national parks and Indian reservations. The situation can be summarized as follows:

$250,000,000 EXCISE TAXES PAID BY MOTORISTS IN 1933

Following is a table of the total collections from federal excise taxes borne by motorists up to December 1, 1933. The addition of the December collections to this sum will bring the total to approximately $250,000,000.

U. S. Internal Revenue collections for first 11 months of 1933:

Commodity	Amt. collected
Gasoline	$158,415,550 78
Lubricating oil	20,006,631 48
Tires and tubes	22,276,037 27
Automobile trucks	2,802,790 34
Automobiles and motor cycles	21,062,363 23
Auto parts and accessories	3,886,167 78
Total collections	$228,449,540 93

TRAFFIC OF 675,000 VEHICLES PAYS ANNUAL COST OF HIGHWAY

A study of costs on various types of highways attributed to the National Research Council shows that an annual traffic of 675,000 vehicles apparently contributes enough through taxes on the average to pay the annual cost of a high type road.

Grandpa—Don't cry sonny. Grandpa will play Indian with you.

Sonny—But y-y-you won't do any good. Y-y-you're scalped already.—*Mississippi Highways.*

RESOLUTIONS ADOPTED

1. The American Association of State Highway Officials has adopted a resolution favoring Federal Aid on the old basis for the two years of 1935 and 1936 in order that the States might proceed with their regular programs.

2. At the Western Inter-State Highway Conference at Reno, Nevada, many of the leading road officials, engineers, experts of the far west, including former Senator Tasker L. Oddie of Nevada caused a similar resolution to be passed and requested the AAA to fight aggressively for it.

3. The belief is growing that the $450,000,000 appropriation carried in the National Industrial Recovery Act is being expended largely on the basis of unemployed relief; that it has not furnished a substitute for Federal Aid; that as a result, the development of the Federal Aid System as such is in danger of languishing; and that many other States are advocating the functions of NIRA because it is not necessary for the States to match Federal funds under the emergency grants.

Advertising Sign Removal Campaign Begins Along all State Highways

By **MORGAN KEATON**, Assistant Deputy Director of Public Works

THE six months period of grace allowed by the Outdoor Advertising Act ended February 22, 1934. That act, known as Chapter 341, Statutes of 1933, became a law August 21, 1933. Section 16 of the act reads as follows:

MORGAN KEATON

"All advertising structures or signs which are placed and/or maintained or which exist in violation of the provisions of this act at a time more than six months from and after the date this act becomes effective, shall be deemed and considered to be public nuisances and may be removed by any public employee as further provided in this act without doing unnecessary injury and the same shall not constitute a breach of the peace."

Therefore, February 22, 1934, was named the "deadline" when all signs and structures must conform to the provisions of the law or be removed by the Maintenance Department of the Division of Highways.

REMOVAL OPERATIONS BEGIN

The first effective enforcement of the act will be the removal of all signs, structures and advertising devices that tend to increase the dangers incident to traveling, particularly when the boards are located in the vicinity of curves, intersections, underpasses, bridges and railroad crossings, or within drainage channels where flood menace may occur.

Following the deadline of Washington's Birthday upon ten days written notice all signs and structures will be removed which violate the following provisions of the law:

1. If within 300 feet of an intersecting or intercepting highway, except subdivided areas and in cases where buildings already obscure the view of the motorists.
2. If within 300 feet of an intersecting highway and railroad right of way.
3. If obstructing clear view of the approach of vehicles on highway for a distance of 500 feet.
4. If within the highway right of way.
5. If imitating warning, stop or danger signals.
6. If with red light or blinking lights likely to be mistaken for a danger signal.
7. If in a drainage channel.
8. If unsafe from storms and wind.

SAFETY PRIME FACTOR

All of the above prohibitions are regarded in the light of being a direct benefit to the peace and security of the motorist and come directly under the police powers of the State. There is no question that advertising signs along the highways tend to increase the dangers of traveling because they attract the attention of the motorist, which, of course, is the prime reason for their existence. Such dangers are considered greatest where the traffic is the greatest and at the points where prohibited locations are specified in this new outdoor advertising law.

RECORD OF REVENUES

License and permit fees have been paid into the Director of Public Works up to and including January 31, 1934, in the amount of $9,942.98. The tabulation below gives in detail these revenues by the month from September 1, 1933, to January 31, 1934.

LICENSES

Month	Collections	Refunds	Net Revenue	Total
Sept.	$454.24		$454.24	
Oct.	779.28		779.28	
Nov.	660.46		660.46	
Dec.	739.77		739.77	
Jan.	429.22	$4.16	425.06	
Totals	$3,062.97	$4.16	$3,058.81	
*Jan. 30-31	116.67		116.67	
	$3,179.64	$4.16	$3,175.48	$3,175.48

PERMITS

Oct.	$912.75		$912.75	
Nov.	1,323.50	$1.00	1,322.50	
Dec.	1,010.00	5.00	1,005.00	
Jan.	3,044.50	4.50	3,040.00	
Totals	$6,290.75	$10.50	$6,280.25	
*Jan. 30-31	489.00	1.75	487.25	
	$6,779.75	$12.25	$6,767.50	6,767.50
				$9,942.98

(*) Collections for January 30 and 31 entered in highways books in February.

(Continued on page 21)

VIOLATING THE LAW

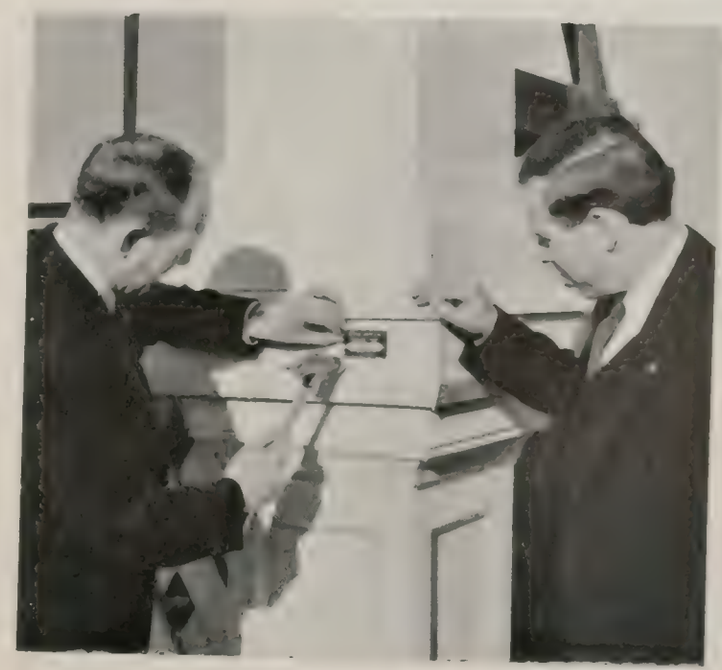
which became effective February 22d, governing the location of outdoor advertising signs along highways, the large billboard in the top picture is being removed. The law forbids any advertising sign structure within 300 feet of an intersection or intercepting highway.

DOWN COMES THE SIGN

as illustrated in the lower scene where workmen are removing the offending billboard under the direction of Morgan Keaton, Assistant Deputy Director of Public Works, and his assistant, James M. Call.

SILENT TESTIMONY

that the sign is legally located and has complied with all the terms of the law is given by a small metal license plate.



Governor Gave Quick Aid in Flood Area

(Continued from page 2)

work, as personal representative of the Governor, and proceeded immediately to organize all agencies of the State Department of Public Works which could lawfully be used in providing relief to people rendered homeless by the flood and in general rehabilitation of the devastated area.

Mr. Kelly pledged on behalf of the State the immediate repairing and reopening of the State highways through this section and the construction of seven or more temporary bridges over Verdugo Wash in Glendale. Relief crews were promptly organized with several power shovels and a fleet of trucks to clear Foohtill Boulevard and San Fernando Road.

PROVIDED WATER SUPPLY

In addition the Department of Public Works sent tank trucks of clean drinking water, from the North Hollywood shop of the Division of Highways, to the Montrose district. Several thousand C.W.A. relief workers were rushed to the flooded area to render aid to the population and salvage as much property as possible.

It was to be expected that a storm such as this which destroyed property over a wide area in southern California would do considerable damage to the State highways which are the backbone of the highway transportation system in this area. In the aggregate a large amount of damage was done to the State Highway System, but it was over widely scattered areas and in most places not serious enough in any one location to permanently put the highways out of commision or even seriously damage them.

With the exception of Foothill Boulevard near Montrose, which was covered by a thick blanket of boulders and mud, none of the primary highways in Los Angeles, Ventura or Orange counties were closed for any considerable length of time

RIDGE ALTERNATE SUFFERED LITTLE

The Ridge Route Alternate, one of the newer of the major State highways, suffered much less damage than would have been expected. One slide just north of Whittaker Ridge Summit closed this route for twenty hours but, aside from this temporary blocking of the road, traffic was able to move continuously over the route

The concrete-lined channel change at French Flat handled the unusual run-off from Piru Creek as expected and there was considerable satisfaction in having this design, which is unique in highway construction, function so well. Aside from the slide at Whittaker Ridge Summit, and a few minor slides, damage was confined to erosion of embankment slopes and to some of the highway shoulders which had not yet been oiled.

The territory where the heaviest deposits were left on the State highways was the Montrose-La Crescenta district. Immense boulders were brought down, many ranging in size from 15 to 25 tons. One of these, weighing more than 25 tons, lodged in the inlet of the new Pickens Wash bridge and had to be blasted to pieces in order to remove it. Another boulder, at least 20 tons in weight, was lodged on the southerly edge of the highway near this same bridge; and plans are now on foot to make of this a Memorial Rock, permanently recording on a bronze tablet affixed thereto, a record of the disaster.

MAINTENANCE STATION DEMOLISHED

The State Highway Maintenance Station at La Crescenta was practically demolished, the foreman and his family barely escaping with their lives The maintenance foreman and his men, living up to the traditions of the force, had been working almost continuously since the beginning of the storm trying to turn the flood with sand bag revetments

When the crest of the flood came, he and his wife were swept through the garage but fortunately lodged against a tree and made their way to safety. The maintenance yard was left with a new rock-strewn channel winding its way from one end to the other, and extending back to the mountains.

Approximately 25,000 cubic yards of silt and boulders were deposited on the traveled way on this portion of Foothill Boulevard alone, and culvert inlets were blocked by silt and debris, and wing walls of several culverts and bridges were broken. The estimated cost of repairs on this section is approximately $19,000.

$270,000 HIGHWAY DAMAGE

The total damage to the 1060 miles of highway under State maintenance in Los Angeles, Ventura and Orange counties was approximately $270,000. With the exception of the La Crescenta-Montrose area, the damage to the primary highways was so widely scattered as not to seriously inconvenience traffic. It is worthy of note that the only highways, with this one exception, which were put out of use by the storm for any considerable length of time, were the Maricopa-Ventura, the San Gabriel Canyon and the Topanga Canyon highways, which are secondary roads through mountainous country. These roads were taken into the State Highway System within the last year, have comparatively light traffic and are not built to the standards of our primary roads.

It is also worthy of note that only two bridges were washed out on the State highways in Los Angeles, Orange and Ventura counties, both of which were old wooden structures over Alhambra Wash only a short distancce apart, one on San Gabriel Boulevard and the other on Garvey Avenue. Garvey Avenue was taken into the State Highway System about $2\frac{1}{2}$ years ago and San Gabriel Boulevard only last August. These bridges were located a short distance east of Monterey Park.

CANYON ROADS BLOCKED

The San Gabriel Canyon highway was entirely blocked by slides, there being probably 120,000 cubic yards of silt and slide material deposited on the roadway and gutters but it was opened to one-way traffic within a week. The Topanga Canyon highway was

All Primary Routes in Flood Area Soon Opened to Traffic

(Continued from preceding page)

badly washed out, in the neighborhood of 84,000 cubic yards of material being washed away.

The new Maricopa-Ventura highway which was built by the joint highway district of Ventura, Santa Barbara and Kern counties with State and Federal aid and was taken over by the State only a few months ago, was badly damaged by washouts and slides but it will be opened to traffic by the middle of this month.

Studies are being made by engineers of the State Highway Department to determine the extent of the storm damage and what lessons, if any, can be learned from this storm, in the design of our future highways.

In reviewing the storm damage it seems apparent that modern standards of construction are adequate for nearly all conditions with respect to drainage structures; that although the aggregate damage was high, it would be uneconomical to provide drainage facilities which would be entirely adequate for such an unprecedented storm, which, in all probability, will not occur again within the next fifty years.

Since Director Kelly took charge of the relief and rehabilitation work on January 3d, much has been accomplished. All of the primary routes are now open to traffic, the major portion of the work remaining to be done being the clearing of slides on some of the mountainous secondary roads.

On the whole, it is felt that the State Highway System has weathered this storm in a very creditable manner.

Probably the most valuable lessons gained by experience from the storm were the usefulness of vegetation on mountainous country to check run-off and prevent erosion and the value of debris basins in checking boulders and debris which would otherwise be carried downstream to endanger lives and property.

ORTEGA HILL PAVEMENT BEING WIDENED WITH 10-FOOT STRIP

In Santa Barbara County on the Coast Highway between Summerland and Sheffield Drive, locally known as Ortega Hill, the 30-foot pavement is being widened for a distance of 0.6 of a mile with a 10-foot cement concrete pavement strip on a 56-foot roadbed.

This project comes under the provisions of the National Industrial Recovery Act of 1933. It is expected the work will be completed in February.

A metropolitan contractor's son, in the country for the first time, saw a cow being milked.

"Now you know where the milk comes from, don't you?" he was asked.

"Sure," he replied. "You give the cow some breakfast food and water and then drain the crankcase."

"My wife always gets historical when I stay out late at night."

"Hysterical, you mean."

"No, historical. She digs up all my past."

N. I. R. A. HIGHWAY PROGRAM 64.4 PER CENT UNDER WAY

Progress made on emergency construction of public works highways to January 6 under the supervision of the U. S. Bureau of Public Roads shows a total of 5337 projects, estimated to cost $276,197,000, had been advertised for contract or begun by day labor employed directly by the highway authorities. The cost of the day labor projects included in the above is estimated at $20,207,000.

Of the 4587 projects awarded for construction, 2865 were under construction on January 6, and 500 were completed. The work under construction, which is estimated to cost $166,576,000, was giving regular employment to 130,045 men.

In the whole country, work advertised for contract or started by day labor employed directly by the highway authorities involved 64.4 per cent of the $400,000,000 provided for public works highways under section 204 of the National Industrial Recovery Act.

REDWOOD HIGHWAY REALIGNMENT

(Continued from page 8)

what is known as the Greenlaw Bluffs near the south end of the project.

SLIDE TRAGEDIES

The latter terrain is composed of a loose ravelling sandstone, becoming particularly active with slides during the severe storms characteristic of this locality, causing many accidents both to the public, and men engaged on maintenance operations.

About four years ago one of the maintenance men in attempting to keep the road open to travel was trapped in one of the slides, being carried down to the river below, his body not being recovered for several hours afterwards. Another near tragedy occurred on the present construction when a man engaged on the high slopes was carried down to the roadway in a slide. He was almost completely buried, only the back of his head serving as a guide to fellow workmen as to his whereabouts. He was extricated however, suffering nothing more serious than some quite painful bruises as the result of the accident.

The tourist rushed into the village shop.

"I want a quart of oil, some gasoline, a couple of spark plugs, a five-gallon can, and four pie tins."

"All right," replied the enterprising clerk, "and you can assemble 'er in the back room if you want to."—*Illinois Central.*

Travel Time Halved, 3 R.R. Crossings Eliminated on Victory Highway Link

By **C. H. WHITMORE,** District Engineer

THE closing of 1933 saw the completion of the last unimproved portion of the Auburn-Truckee highway, except for the portion along the shore of Donner Lake.

Since January, 1932, grading and surfacing operations have been in progress on the road between Gold Run and Airport, a portion of State Highway Route 37, to replace what was merely a wagon trail, improved only sufficiently for the barest of traffic needs.

The country through which the new road is projected is rich in historic value. Located either along the route, or short distances away and served by this road, are Gold Run, Emigrant Gap, Donner Summit, Donner Lake, and Lake Tahoe, names that conjure memories of early California history.

State Highway Route 37, of which this portion of road is a part, in addition to serving recreational traffic, is the only year-round east-west trunk road leading out of northern California, and is becoming, ever increasingly, one of the main transportation highways between California and eastward points. Of the peak traffic (2000 units daily, expected to reach 4000 in a short time), a considerable portion consists, particularly in the summer, of interstate and transcontinental travel.

NEW HIGHWAY between Gold Run and Airport shown by heavy black line.

HISTORIC LANDMARKS

The first-mentioned name is of a settlement intimately connected with the early gold mining days of the State. The Gap, Donner Summit, and Donner Lake are landmarks of the route taken by the ill-fated Donner Party and other less unfortunate of the early settlers bound for land occupancy of northern California and lower Oregon.

Lake Tahoe, the center of one of the largest recreational areas in the country, is world-famed for the beauty of its setting, its boating, fishing and bathing facilities in the summer, and the snow sports that are held nearby its shores in the winter time.

About one mile of the new road near the westerly end is benched into the banks left by hydraulic mining operations. These banks are as high as 100 and 150 feet above the floor of the diggings. In the early days these diggings were the scene of much gold mining activities from which many thousands of dollars worth of "yellow dust" were obtained.

The old road, which new construction supplants, is narrow and steep, poorly aligned, and crosses at grade the Southern Pacific Railroad at three points within its length. As a consequence, travel was slow, hazardous, and subject to delays caused by train crossings.

DRIVING TIME HALVED

New construction not only shortens the distance between the termini common to both the old and new roads, but encounters no grade crossings, is of adequate width, and of high-standard curvature and easy grades to permit vehicles to travel the 11½ miles at the

OLD GOLD DIGGINGS are traversed by this portion of the Victory Highway realignment between Gold Run and Airport where hydraulic monitors washed down thousands of dollars worth of "yellow dust."

SPEEDY, SAFE TRAVELING for motorists is provided by the 11.5 miles of new highway on the Donner Summit route affording the only year-round trunk road leading out of northern California.

legal speed limit in comfort and safety. The driving time between these limits is practically halved.

The entire construction consisted of three distinct phases: one for the grading work, one for the surfacing, and another for a reinforced concrete underpass of the Southern Pacific Railroad at Towle, approximately one-third of the way along the project. The underpass, constructed during the life of the grading contract, is the only crossing of the railroad by the new highway.

The roadbed was graded to a width of 30 feet. A 6-inch thick subbase of crushed stone was placed for the full width of the roadbed. On the central 20-foot width of the road, which provides the traveled way, premixed asphalt-treated crushed stone was placed to a thickness of 3 inches. Of equal thickness, bordering the traveled way, shoulders of crushed stone were placed.

CONSTRUCTION METHODS

The crushed stone was produced by the contractor from a local quarry. Material for the base and for the shoulders was crushed and graded to the specified size, mixed with water in a pugmill mixer (slurry mix), and then hauled to placement on the roadbed. Two objects are obtained by this method of construction: one is the retention, instead of a certain loss where the crushed stone is not

(Continued on page 22)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ..... Director
JOHN W. HOWE ..... Editor

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Imperative Planning

There is convincing proof in the present situation to any open minded person that the time to declare a holiday in highway construction, so frequently suggested, is not even near. The country's highway program is not half completed. However, it has reached a stage where planning along new lines is imperative. The first railroads were built without thought of permanency or their future development. Preemption of traffic territory was chief objective of pioneer railroad builders. Those lines which were logically located have been rebuilt again and again to meet demands for traffic. And so it is with the highways. Realignment and reconstruction have become the order of the day on logical routes of travel.

To meet the demands of the present and the future the highways must be made safe for fast traffic and must also be designed for the economical operation of motor vehicles if they are to satisfy those who pay through taxation for their improvement and maintenance. At one period in the development of railroads vast sums were spent in reducing grades and building cut-offs to reduce cost of operation. Many lines that were maintained at a loss were thus made profitable to stockholders. Highways have now reached a similar stage in their development. Cutting down grades and building cut-offs on the highways has just begun. Grade separation and by-passing of through traffic have scarcely been started and present probably the greatest problems of the future.—*Southwest Builder and Contractor.*

A small boy had taken his mother's powder puff and was in the act of powdering his face when his small sister, aged five, snatched it from him.

"You musn't do that," she exclaimed. "Only ladies use powder—gentlemen wash theirselves."—*Automobile Bulletin.*

State Gasoline Tax Revenue Shows Loss of $863,941 for 1933

GASOLINE tax assessments for the calendar year 1933 amounted to $39,307,388.96, a drop from 1932 of $863,949.91 or 2.15 per cent, and a drop from 1931 of $2,318,502.55 or 5.57 per cent. The encouraging conclusion to be drawn from these figures is that the rate of decrease in the gasoline tax revenue having been substantially reduced during the past year from that of the preceding year there is a reasonable probability that the revenue for 1934 will equal that of 1933.

Any material improvement in business conditions during 1934 is likely to produce a substantial increase in the revenue for 1934 as compared with 1933.

The November, 1933, assessment which exceeded that of 1932 by 28 per cent appeared to indicate a decided improvement in business conditions. It now appears that such a conclusion was not warranted or at least if business conditions were improved during December the public spent its money for other things than gasoline, as the revenue for December, 1933, dropped $211,722 from that of December, 1932, or 6.87 per cent.

Apportionment of $5,102,867.06 to the State Department of Public Works and the counties of California is announced by Registrar Russell Bevans of the Department of Motor Vehicles.

This sum represents the State's and counties' share of motor vehicle registration fees collected in 1933 after deductions are made for handling all registration matters and for operation of the California Highway Patrol.

Half of the amount collected, $2,551,433.53, will go to the Department of Public Works to carry on the road-building program approved by Governor James Rolph, Jr., for the relief of unemployment.

The counties will be apportioned the other half on the bases of motor vehicle registration from each.

The total fee-paid registration for the year, 2,036,918, was paid on 1,850,608 automobiles, 5794 solid tire trucks, 102,395 pneumatic tire trucks, 8134 motorcycles, 6151 solid tire trailers and 63,836 pneumatic tire trailers.

Los Angeles County, with its huge motor vehicle registration, receives the largest amount, $1,042,283.14; San Francisco's share is $185,632.09.

Traffic Savings Will Write Off Cost

(Continued from page 4)

the old alignment, regardless of the additional factor of savings to traffic.

SAFETY FACTOR IMPERATIVE

The extremely heavy trucking on this highway, many of the trucks hauling trailers, emphasizes the vital need of frequent and long stretches of straight line or very slight curvature to permit safely passing slow moving vehicles, and this great advantage has been fully provided in the new construction. The importance of this feature of the design is of such value that the reconstruction cost would have been justified on that basis alone and it became imperative when analysis revealed that the project as constructed involved less expense than would have attached to improvement along the old line.

In addition to these important advantages, the direct money savings due to avoiding bridge construction and maintenance and to shortening the length of line to be constructed and maintained, capitalize to a value sufficient to write off the entire cost of the improvement within a period of 30 years—even on a basis of present traffic volume. The three-tenths mile saved in length of line is in this case particularly subject to capitalization, because the road is primarily a through route for traffic seeking to save time and distance.

TRAFFIC INCREASINGLY HEAVY

The development and importance of this highway as an arterial route will grow in proportion as industry and population increase in the Bay Region and in the great interior valleys for it occupies one of the few natural passes through the long chain of hills in the Coast Range.

The development of this road traces back through many years. It has been under heavy traffic from the inception of highway development in central California. By the close of the first decade of this century the automobile had become such a problem in highway requirements that this important arterial of travel had to be improved; and the local county authorities made extensive efforts in this direction through the years 1911 to 1914.

The net result was a winding undulating grade with asphalt treated surface which was fondly called the Hayward-Dublin Boulevard. These improvements, although designed with no faintest anticipation of the swiftly increasing highway requirements, were immediately invaded by the growing swarms of automobiles, and the horse and buggy "boulevard" soon became simply another inadequate road.

AN OUTSTANDING ACHIEVEMENT

In 1915 the State adopted the Dublin Canyon Road as a State highway and began to put the entire section through a series of stage improvement, culminating in complete reconstruction during the past year; so that today this road is an outstanding achievement in highway construction.

The project is outstanding, not because of extremely heavy construction; for there have been many projects in our recent highway developments where more material was moved to make a half mile of road than was required to construct this entire six miles of 46-foot highway. The striking feature of the finished work is the impression one has of its nice balance, its graceful sweep of line and grade, its apparently easy mastery of difficulties in the terrain.

PROVISION FOR EXTRA LANE

From any point along the line the vision commands long vistas of the road, and ingenuity would be hard pressed to find where further improvement could be made in the essentials except at extreme expense.

As time passes and need requires, the present three lanes for traffic can be increased to four, for which the new road was designed. Pavement surfaces will be repaired or replaced, but it is probable that the basic design will satisfy requirements for many years to come.

The strategic position of this canyon and the village of Dublin at one end of it have combined to give this great State highway "a local habitation and a name," both of which are destined to grow in fame and useful service.

"Uncle Mose, your first wife tells me you are three months behind with your alimony."

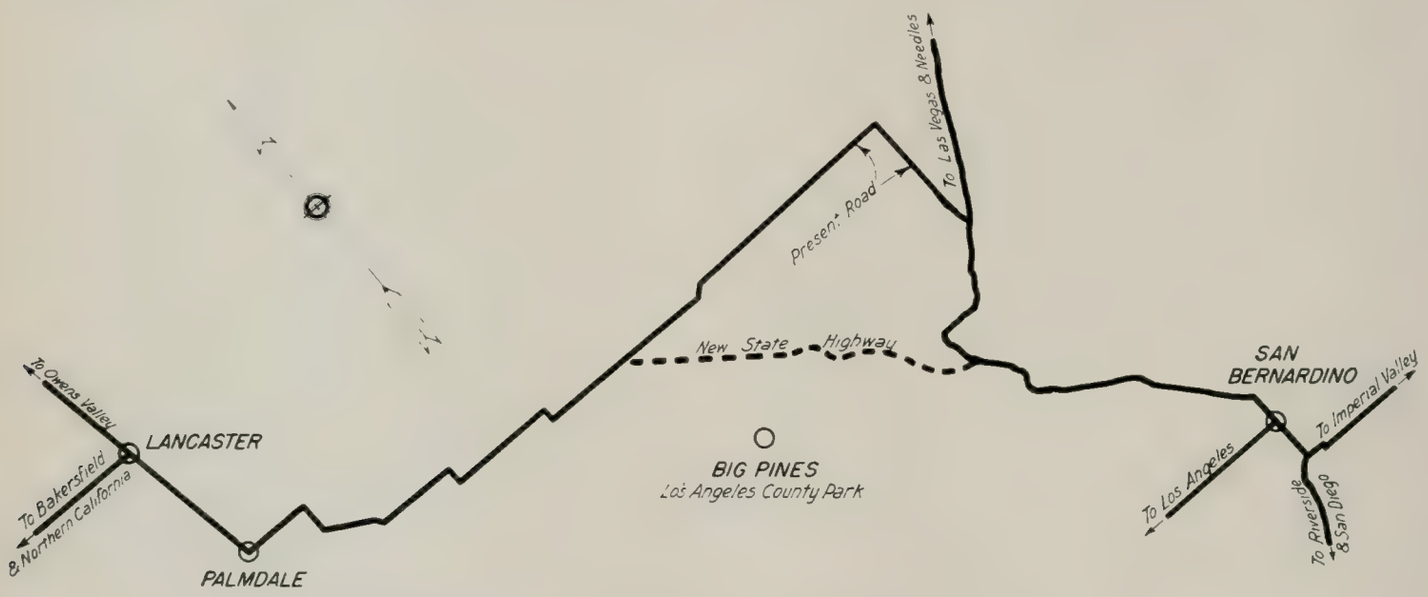
"Yes, Jedge. Ah reckon dat am so, but you see it's jes dis way. Dat second wife of mine ain't turned out to be the worker Ah thought she was gwine to be."

Work Begun on $240,000 Highway to Link North and South Via Desert

By **E. Q. SULLIVAN,** District Engineer

THE dream of the people of the eastern portion of southern California for a direct highway connection with northern California is at last coming true in the construction of the first link of the Cajon-Lancaster route connecting San Bernardino with the Owens Valley and San Joaquin Valley highways.

With $240,000 provided in the budget, the first contract has been awarded and work has started. About 300,000 population of the southeastern part of California will at last be offered a good direct connection to northern California by this new route crossing the southern end of the Mojave Desert.



Sketch map of Cajon-Lancaster highway project.

This route will serve as a direct highway on easy grades for Imperial County and the Riverside-San Bernardino area. Winter vegetables, citrus fruits, and other products of this area can be delivered to the San Francisco Bay Region over this new State highway. People from the San Francisco Bay Region can come direct to the desert resorts to enjoy winter sunshine.

SAVES FIFTEEN MILES

There will be a saving of 15½ miles in distance by the construction of this first link of the new highway, compared with the length of the existing road. Other savings in distance will be possible when the route is completed. The new route will also have the advantage of much easier grades and better alignment than the existing road.

The new route leaves the present State highway near Camp Cajon, 18 miles north of San Bernardino, and swings northwest up the gently rising Cajon Valley on easy grades to the head of the valley. At the head of Cajon Valley there is only the one summit to climb over. The alignment in crossing this summit is direct; the grades are light.

It will be possible sometime in the future to make a connection from this summit to the Los Angeles County Park at Big Pines. The new road with this possible connection lends itself to an approach via both Palmdale and San Bernardino that will be high gear all the way from Los Angeles.

This new route will also offer a delightful 5-hour round trip pleasure drive for Los Angeles people, out to the desert via Mint Canyon, and home to Los Angeles through the Cajon Pass. The trip up Mint Canyon to Palmdale and along the base of the Sierra Madre Mountains to the head of Cajon Valley offers magnificent desert views with a striking contrast of the beautiful tree-lined avenues on the way home to Los Angeles via San Bernardino and Riverside.

Cajon Valley and the desert area north of Big Pines has a particular fascination to all

DESERT HILLS SHAVEN AND SHORN of shrubbery by unemployment relief quotas of highway workers mark the route of the Cajon-Lancaster link across the southern end of the Mojave Desert that will establish a new connection between northern and southern California via San Bernardino, Cajon Valley, Lancaster and Bakersfield. The clearing and grubbing is being done largely by hand labor.

those who have yielded to its spell. There is an abundant growth of pinon pines, joshua trees, junipers, and yuccas. When spring rains come at the right time, the desert flowers of this region are a sea of bright colors across the great stretches of desert plains to the north.

This new highway will skirt the north base of the Sierra Madres, with the slopes of Cucamonga Mountain, Mt. San Antonio, and North Baldy, and other high peaks rising in snow-capped majesty as a continuous panorama. Even in years of light snowfall, the north slopes of these mountain peaks are completely snow covered all winter and until late in the spring.

This first link of the new highway will be completed for next winter's travel.

ADVERTISING SIGN REMOVAL

(Continued from page 12)

Since the act became a law considerable work has been experienced in getting it under way. New forms were required for applications; permit forms printed and permit plates made in conformity with its provisions. The fees set by the Legislature are intended to carry the expenses of the administration of the law. To have the fees greater than the cost of enforcement, of course, would be an additional tax burden; but to have the fees cover only the actual cost of enforcement, constitutes regulatory legislation and not added taxation.

It should be stated here that these fees have and will be required to enforce the provisions of the act and it is regarded as certain now that the receipt of these fees will be materially increased for this year because it will be necessary to increase the expenses of enforcement now that the six months' probation period is over.

Following the cleaning up of the prohibited locations of signs or structures on the highway there will begin a campaign to require that all signs and structures have a permit to remain in existence after the twenty-second of February. Permits will be evidenced by a license plate, showing the year and number of the permit, placed upon the face of the structure or sign. In due course every sign or structure in the State must carry this tag or be removed from the view of the highway.

The present enforcing personnel consists of:

1 chief enforcing officer, Assistant Deputy Director of Public Works.
1 assistant.
2 stenographer-clerks.
6 inspectors, covering the field.

This force will later be augmented by the entire Maintenance Department of the Division of Highways.

5,600,000 Yards of Overhaul on Victory Link

(Continued from page 17)

so wetted, of all the fine material; the other, the uniform distribution of the fine material throughout the coarser stone. A better bonded and better stabilized road metaling is thus achieved.

The method of manipulation of the asphalt-treated surfacing consisted of: first, mixing of the asphalt and the crushed stone in a pugmill mixer; second, hauling the mixed material to the road and spreading it; third, a second mixing of the material and respreading it and rolling it to the specified grade, width and cross-section.

Both grading and surfacing projects were large-scale operations, involving the movement of enormous yardage of earth work and production of a considerable tonnage of crushed stone for the surfacing. As an evidence of this, final figures on construction reveal that:

ROCKWORK SEAT and drinking fountain on new realignment

OPERATION FIGURES

(a) 838,000 cubic yards of earth were moved from cut to fill sections.

(b) 5,600,000 station yards of overhaul were necessary in moving the earth.

(c) 92,000 cubic yards stone were crushed for the surfacing work.

(d) 10,000,000 gallons of water were used for compacting the new earth work and mixing the crushed stone base and shoulders.

(e) 1,100 tons of asphalt were used for mixing the road surfacing.

(f) 22,000 lineal feet of culvert and drain pipe were placed to provide adequate drainage.

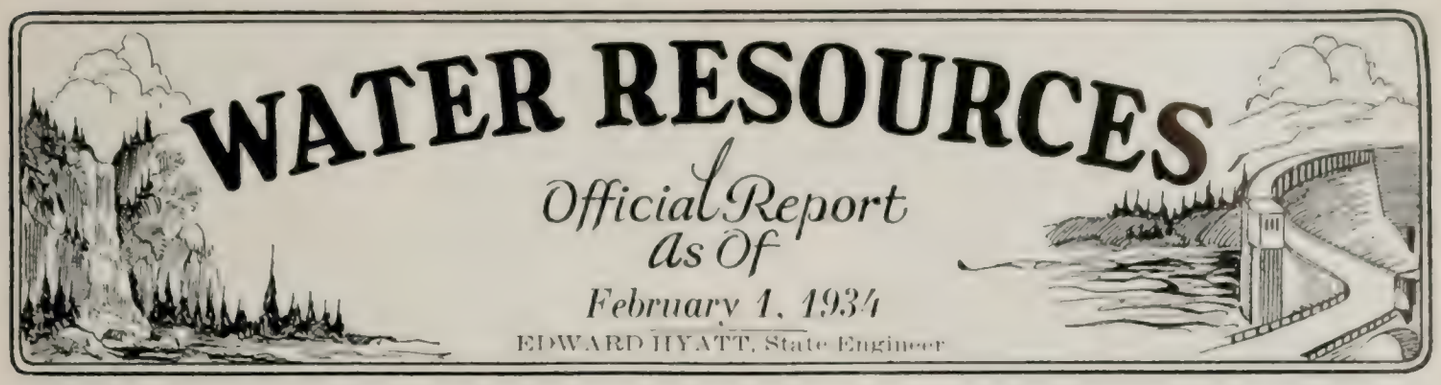
(g) 1,700 cubic yards of structure concrete were involved in construction of the Towle underpass and roadway concrete culverts.

BEAUTIFICATION treatment of culvert and access to brook

The recorded quantities are for only the major items of work. Miscellaneous construction, plus the value of the recorded items, resulted in a total cost of $600,000. On the grading contract the State received the customary Federal aid for new construction of a rural post road, of which this project is a part.

The daily grading progress reached its peak with the movement of 7000 cubic yards of earth work. The maximum tonnage of crushed stone material placed in one day on the roadbed was 2000 tons.

(Continued on page 24)



Progress in maintenance and flood control work is detailed in the regular monthly report of State Engineer Hyatt. Much of this work is being done by CWA county quota men but in several counties with small labor quotas work is being held up on certain State projects because all CWA labor is employed on local projects.

A moderate storm early in the month did not bring any of the streams in Sacramento Valley to high flood stage, the water spilling over various weirs for only short periods. Storm run-off of the Sacramento River at Sacramento for the period December 30th to January 19th approximated 1,500,000 acre-feet.

Details of dam applications, topographic mapping and other activities of the department are given in the report as follows:

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Under Project No. 502, Sacramento County CWA has furnished 33 men for clearing in the American River overflow channel, beginning work on December 8th. This project calls for a total of 2400 man-hours and an application has been recently made to continue for an additional 3000 man-hours At the present time the crew is working 24 hours per week, in conformity with the recent order for reduction. Up to this time no CWA men have been made available for work on Project No. 502, flood control maintenance, in Yolo and Yuba counties.

Sacramento Flood Control Project—Bank Protection.

Work under the State-Federal cooperative program for permanent bank protection under the U. S. Engineer office at Sacramento is nearly completed as to the work under way in Districts 1500, 108 and 2047 and Levee District No. 3 of Glenn County. Twenty-five thousand dollars additional has been paid to the War Department from the State appropriation to continue the work at a total cost of $150,000 for this fiscal year.

Russian River Jetty.

During this period there have been several severe storms, during each of which some damage was done to the trestle. The last of these was on January 16th, at which time the last span of the trestle deck was removed at the shore end, the entire trestle deck being now removed. Only about four of the steel piles were broken, the remainder being bent over after the support of the deck was removed, but it is believed that most of these can be straightened for use in connection with the construction of a temporary trestle, put forward as the work of placing rock advances. This trestle has been in use for placing rock since August, 1931, a period of 28 months. The actual damage done by the storms is estimated at $6,000.

During this period work has proceeded under CWA Project No. SLF 70, with 14 men. On December 19th the time was reduced from 30 to 15 hours per week and will continue on this basis until additional money is made available.

Mokelumne River.

On December 18th work was started on clearing the channel of the Mokelumne River from New Hope Bridge to Woodbridge in San Joaquin County. The work is being done under the direction of this office with a San Joaquin County CWA crew of 100 men, two foremen, and one supervisor furnished by this office.

This project provides for 30,000 man-hours, of which about 60 per cent has now been used. At present it is proceeding at the rate of 15 working hours per week.

WATER RIGHTS

Supervision of Appropriation of Water.

During the month of December, 25 applications to appropriate water were received; 26 applications were approved and 26 were canceled. During the same period 9 permits were revoked and the rights under 3 permits were confirmed by the issuance of license.

Sacramento-San Joaquin Water Supervisor.

After dropping to about 10,000 second-feet in the latter part of December, the flow of the Sacramento River at Sacramento was augmented by the storm of early January to a maximum of 58,000 second-feet on January 4. This had gradually dropped to 13,000 second-feet on January 19. Storm run-off from December 30, 1933, to January 19, 1934, amounted to approximately 1,500,000 acre-feet.

DAMS

The application of the Pacheco Pass Water District for the construction of a 95-foot earthfill dam on the

(Continued on page 32)

Removal of Car Tracks Gives Arterial Through 5 Cities a 74-Foot Pavement

ONE of the outstanding projects to be undertaken by the State of California for construction within a municipality is the improvement of a portion of San Pablo Avenue through the cities of Oakland, Emeryville, Berkeley, Albany and El Cerrito. This important link, connecting routes in the State Highway System, is the main arterial from the San Francisco Bay area leading to the Carquinez Straits and the Sacramento Valley.

The improvement now under construction consist of widening and placing 20-foot asphalt concrete pavement within the central area of San Pablo Avenue, formerly occupied by tracks of street cars abandoned in lieu of a bus service. The elimination of the car tracks extends from near Ashby Avenue in Berkeley to the city of Richmond and will permit the utilization of the entire width of the street for motor vehicle traffic.

UNDER TWO CONTRACTS

The work is under contract and embraces two units. The first, for complete repaving of the 20-foot central area of the street from Potrero Avenue in El Cerrito to Ashby Avenue in Berkeley. The second unit, recently awarded, covers the widening of San Pablo Avenue through the cities mentioned above from 38th Street in Emeryville to a point near Macdonald Avenue in Richmond. The two contracts will be carried on in unison without impeding the heavy flow of vehicular traffic to which this highway is subjected.

The widening work is done in accordance with plans as prepared by the various cities, and approved by the Division of Highways, and consists of setting back the curbs to a minimum of 5 feet on each side of the roadway and constructing a 5-foot concrete shoulder and resurfacing a portion of the existing pavement with asphalt concrete.

FEDERAL AID PROJECT

The total cost of the two combined contracts is covered by an allocation of $314,026 of Federal aid funds made by the California Highway Commission.

The early completion of the work undertaken by the State will serve two important benefits to vehicular traffic: the elimination of the street car tracks and traffic over a northerly portion of the combined projects allowing free use of pavement, and the provision of an additional width of pavement to a minimum of 74 feet.

This artery will be heavily taxed by local traffic centralizing at the east approach to the San Francisco-Oakland Bay Bridge when this great structure is completed.

All construction work on San Pablo Avenue is being pushed to maximum efficiency in order to provide the greatest amount of hand labor practicable under the contract regulations and it is expected the entire work will be completed before the heavy early summer traffic.

TRAVEL TIME HALVED

(Continued from page 22)

From Gold Run to Baxter's (approximately midway of the project) new construction is on radically different alignment to that of the old road. The routes of old and new construction from Baxter's to Airport are within narrow confines, on the same approximate alignment. On the Gold Run to Baxter's portion, adequate road approaches were provided to furnish service to the settlements on the old roadway that were by-passed by new construction.

A comparison between the old and new route indicates the following:

	Old route	New route
Length	12.97 miles	11.48 miles
Roadbed width	16 feet	30 feet
Maximum grade	12 per cent	6 per cent
Minimum radius curve	50 feet	500 feet
Railroad crossings at grade	3	None

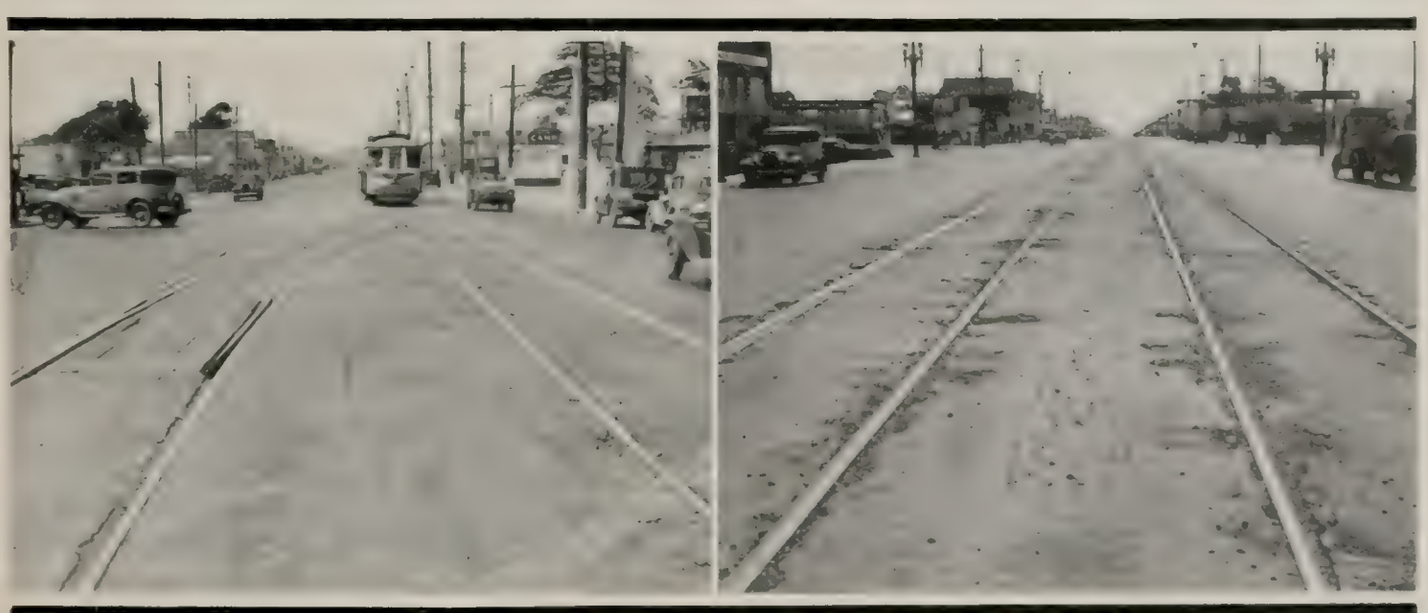
We strongly advise you to see your dentist twice a year, but have your brakes tested at the same time—teeth are only good as long as you are able to sit up and take nourishment.—*Borrow Pit.*

Mistress (to new cook)—"My husband often brings three or four business friends home to dine without warning. You'll be prepared for that, won't you?"

Cook—"You bet, Ma'am! I'll keep my bag packed ready!"—*Humorist.*

EXIT CAR TRACKS on San Pablo Avenue preparatory to repaving by State contract

FINISHED PRODUCT presents a 74-foot pavement adding two broad lanes for motor vehicle traffic.



ROUGH TRACK AREA practically barred center of avenue to motorists

Perpetual Fog Maintained to Cure Cement Concrete in Research Tests

By **F. T. MADDOCKS**, Senior Physical Testing Engineer

There is one spot in California that is bathed in fog 24 hours a day, year after year. This unique place is a room in the testing and research laboratory of the Department of Public Works at Sacramento where cement concrete and mortar samples are subjected to curing temperatures and moisture, some of them for many years. This interesting place is described in the following article.

THE physical properties of cement concrete and cement mortars are very definitely influenced by temperature and moisture. In order to determine whether or not concrete and mortars obtain sufficient strength to pass specification requirements and also to obtain accurate comparisons of strengths from day to day, it is essential that the temperature of curing air and water and the humidity of the curing air be very closely controlled. The American Society for Testing Materials requires a standard temperature of 70 degrees Fahrenheit with a permissible variation of 3 degrees Fahrenheit, and a relative humidity of not less than 90 per cent.

The Materials and Research Department has a "fog room" or moist room installed in the basement of the laboratory. This room is 23 feet long by 12 feet wide by 8 feet high, and is constructed entirely of concrete.

The term "fog room" has been applied to the curing room because it is always filled with a thick spray resembling fog.

In the "fog room" are cured all concrete compression cylinders made at the laboratory to test the concrete-making properties of aggregates, cylinders and beams fabricated in the field by the Resident Engineers to check the quality of the concrete entering into their various projects; all sand-cement mortar cylinders made at the laboratory to determine the concrete-making properties of fine aggregates and cement briquettes for the acceptance of cement entering into all concrete construction. These are kept in the "fog room" until broken.

SOME CURED TEN YEARS

The usual breaking periods for routine work are 7, 10, and 28 days. For special studies, such as those relative to the effect of age and various admixtures upon the strength of concrete, cements manufactured for special purposes, and many others, test specimens are made covering breaking periods up to 10 years.

At the present time the oldest specimens have been in storage about seven years. These are concrete cylinders taken from five different bridge contracts and five different pavement contracts in which different brands of cement were used, for the purpose of determining the effect of age upon the compressive strength of concrete.

FANS BLOW SPRAY

All compressive strength cylinders, beams for flexure tests, sand-cement mortar cylinders, cement briquettes, etc., are cured in the "fog room" until the breaking period.

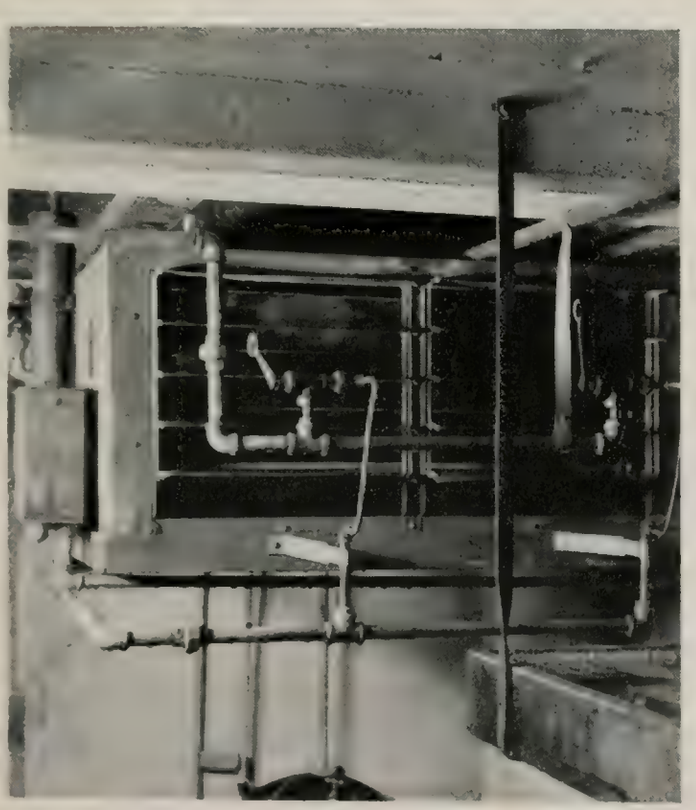
A unit called a diffuser is located at the front end of the "fog room" and controls both the temperature and humidity of the room. It consists of a coil of cooling pipes connected to the refrigerating machine located in an adjoining room. This coil is partly enclosed by a metal case. The back of the case is open and the front fitted with adjustable shutters.

Equally spaced at the rear of the diffuser are two electric fans with 1/15 horsepower motors fully enclosed to make them waterproof. These fans force a strong current of air over the cooling coils and through the shutters. Directly in front of each fan and about one foot in front of the shutters is a spray nozzle pointed directly into the current of air created by the fans. These two nozzles supply the moisture which is blown to all parts of the room.

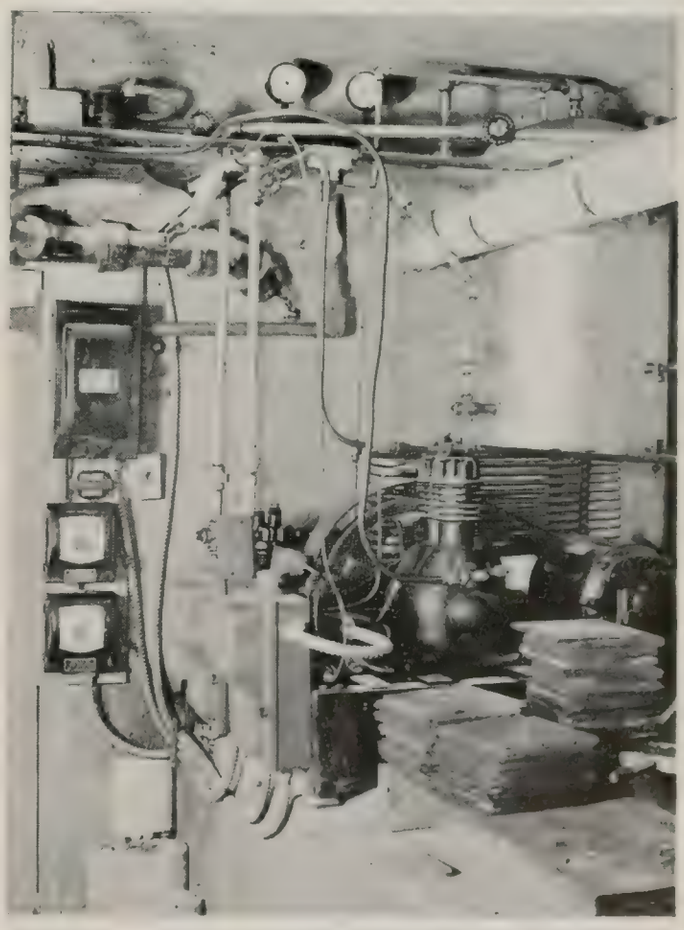
With the exception of the diffuser, all of the equipment is located in a room adjoining the "fog room."

The temperature is controlled by means of a refrigerating plant similar to the electric type used in domestic refrigeration, but of

GENERAL VIEW of fog room for curing concrete samples



DIFFUSER unit which forces air through spray nozzle blowing moisture to all parts of room.



REFRIGERATION and humidity units that control temperature and moisture conditions producing fog.

larger capacity. The plant makes use of the well known principle in physics that heat is given off by a gas when it is compressed and heat is absorbed when compressed gas is released to normal atmospheric pressure.

This particular cooling unit uses methyl chloride as a refrigerant. The gas is compressed to a liquid state in a condenser by means of an air compressor driven by a one horsepower motor. The condenser consists of two coils of copper tubing, one inside the other, the gas being compressed in the space

(Continued on page 28)

Permanent Fog in Test Room Made by Automatic Machines

(Continued from page 27)

between the two tubes. The gas is cooled by water passing through the inner coil.

The compressed gas flows from the condenser through a regulating valve into the coils of the diffuser where it expands and absorbs heat from the air, thereby lowering the temperature. The expanded gas is returned to the compressor to be used again.

A very sensitive thermostat in the moist room gives an automatic control of temperature both day and night. This thermostat is connected by means of a switch to the motor of the refrigeration machine and is so adjusted that the unit starts operating when the room temperature reaches slightly above 70 degree Fahrenheit. The cooling continues until the temperature reaches approximately 70 degrees Fahrenheit. At this point the switch automatically stops the motor.

HUMIDITY CONTROL

The humidity is controlled by means of compressed air and water. An air compressor driven by a 3/4 horsepower motor forces air into a storage tank about one-half filled with water. The air enters the storage tank at the bottom and passes through the water. This removes all dust particles which might cause a clogging of the spray nozzles.

The air pressure is reduced in the line running to the diffuser by means of a reducing valve to a pressure ranging between 22 and 30 pounds. This air line enters a small copper tank on the side of the diffuser filled with filtered water from the laboratory water mains. By means of an ejector, the water is forced through the air nozzles in the form of a spray. The diffuser fans blow the spray to all parts of the room.

The humidity process is automatic. When the air pressure in the storage tank reaches 85 pounds the compressor stops and does not start again until the pressure drops to 40 pounds.

A continuous record is kept of the temperature and humidity of the "fog room" on a chart attached to a clock mechanism.

Young Man—I should like to ask your advice, sir, as to whether you think your daughter would make me a suitable wife.

Lawyer—No, I don't think she would. Ten dollars, please.

Auto Registrations for 1933 Record a Decrease of 4906

Fee-paid motor vehicles registration in California during 1933 totaled 2,036,918, a loss over 1932 of 4906.

This small drop in fee-paid registration indicates an actual improvement over conditions in 1932, when there was a registration decrease of 65,451, according to Motor Vehicle Department officials.

Last year's registrations, as listed by Russell Bevans, Registrar, were: Automobiles, 1,850,608; solid tire trucks, 5794; pneumatic tire trucks, 102,395; motorcycles, 8134; solid tire trailers, 6151; pneumatic tire trailers, 63,836.

These totals do not include the 38,507 vehicles registered by the State, county and city governments and public utility companies for which fee-exempt plates were issued.

As in 1932, registrations of all classifications of vehicles dropped with the exception of pneumatic tire trucks and trailers. These continued to make substantial gains. License fees for these classes of vehicles are much lower than those for solid tire vehicles.

Two Improvements in Santa Barbara City

On the Coast Highway between Olive Mill Road and Santa Barbara city limits, a distance of 0.8 of a mile, the pavement is being widened to a 40-foot asphaltic concrete pavement on a 56-foot roadbed with 8-foot oiled earth shoulders. This work is through the business section of the community of Montecito, a highly improved residential suburb of Santa Barbara.

Bids are being received on the construction of a through boulevard in Santa Barbara city. This includes a route through the city and westerly to a point on Hollister Avenue about one-half mile east of the underpass of the highway under the Southern Pacific tracks. This project comes under the provisions of the National Industrial Recovery Act of 1933. The construction work will be handled under two contracts.

Admirer: "Fifty years of happy married life! How have you managed it?"

Retired Mine Superintendent: "Well, for one thing, son, I've always admitted I was wrong."

Donner Summit Snow Crew Carries on Traditions of the Highway Service

UNCLE SAM'S mail service delivers about one thousand letters daily to the Department of Public Works for distribution to various officials and divisions. Most of these communications, of course, deal with regular business matters in terse business fashion without a touch of human interest in style or subject matter. Many of them in these times bring an all too poignant appeal for relief and employment. A few, like the following, bring a little "pat on the back" for the highway service that makes everybody feel good all along the line:

The Letter

STANDARD OIL COMPANY OF CALIFORNIA
Standard Oil Building
San Francisco, Cal.

Sales Operating Department
J. H. McEachern, Manager
Mr. Earl Lee Kelly
Director of Public Works

Dear Mr. Kelly:

I recently drove over the Truckee Summit on to Lake Tahoe in order that my family might view the snow in the high Sierras. On our return trip, we reached Truckee Monday morning, New Year's Day, and drove over the Truckee Summit shortly after noon, at which time we ran into the worst blizzard that I have ever experienced. It obliterated the road, causing us to stop in front of the roundhouse in which the snow plows are maintained on the Donner Summit.

We were considerably worried as to whether to proceed to Sacramento or endeavor to get back to Truckee; however, before making a definite decision as to our future course, I discussed storm conditions with various members of your organization at the roundhouse on Donner Summit, seeking their advice. They suggested that I follow one of the rotary plows down from the summit and in the course of four or five miles I could see the road and would be able to proceed to my home in San Anselmo. A big, yellow rotary plow was brought out——by this time several other motorists had reached this point and were much concerned with their plight——and we followed the plow down from the summit in perfect safety and proceeded home.

As a taxpayer, I wish to compliment you on having such a fine bunch of men in the State Highway Department in charge of your equipment at Donner Summit, and I desire to express my appreciation of the very courteous manner in which these men treated a stranded motorist who possibly should have been at home in front of the fireplace instead of crossing the Truckee Summit at this time of the year.

Yours very truly,
J. H. McEachern (Signed).

The Reply

Mr. J. H. McEachern, Manager,
Sales Operating Department,
Standard Oil Co. of California.

Dear Mr. McEachern:

I have received your letter of January 2, 1934, and I wish to thank you for the kindly, friendly thought that prompted the sending of it. It is mighty nice in the midst of a busy day to receive a compliment such as you wrote, and coming from a person who occupies your high position.

I am very proud and happy to be the Director of Public Works and to head an organization composed of men who render a real service to the public, often at a great sacrifice to themselves.

You may be very sure that cognizance will be taken of your letter, and the information transmitted to the official in charge of that division, who will in turn relay it to the men affected.

With kindest personal regards and best wishes, I am

Sincerely yours,
EARL LEE KELLY,
Director of Public Works.

Cities of Nation Join in a Safety Contest

New safety records may be established this year with several hundred cities again competing for honors in the Third National Safety Contest, says the Automobile Club of Southern California.

First prize will go to the city which most successfully reduces traffic deaths through a well-rounded accident prevention program. More than 30,500 persons were killed in motor vehicle accidents in the United States during 1933 and a million more were injured, at least 85,000 of which are permanently disabled, according to estimates received by the automobile club.

Highway Bids and Awards

FOR JANUARY

ALAMEDA AND CONTRA COSTA COUNTIES—Through Emeryville, Oakland, Berkeley, Albany and El Cerrito, about 6.8 miles to be graded and paved with asphalt concrete and Portland cement concrete. District IV, Route 14, Section A. Heafey-Moore Co., Oakland, $211,589; Southern California Roads Co., Los Angeles, $216,217. Contract awarded to Peninsula Paving Co., San Francisco, $209,964.

AMADOR COUNTY—Between 4 miles west of Pine Grove and ½ mile west of Pine Grove, about 3.4 miles to be graded and surfaced with crushed gravel or stone. District X, Route 34, Section C. Coats Construction Co., Sacramento, $67,866; Biasotti, Willard & Biasotti, Stockton, $69,839; Larsen Bros., Sacramento, $57,993; J. A. Casson, Haywards, $64,088; Granite Construction Co., Ltd., Watsonville, $62,154; Kennedy Construction Co., Oakland, $78,234; Contoules Construction Co., San Francisco, $69,784. Contract awarded to Hemstreet & Bell, Marysville, $57,413.

FRESNO COUNTY—In Fresno between California Ave. and Echo Ave., 0.8 of a mile to be graded and paved with asphalt concrete. District VI, Route 4. Jack Casson, Hayward, $57,332. Contract awarded to Valley Paving and Construction Co., Fresno, $52,934.40.

HUMBOLDT COUNTY—Bridge across south fork of the Eel River at Smith Point, consisting of two 100-foot, two 120-foot plain girder spans and two 57½-foot reinforced concrete girder spans on concrete piers and foundations. District I, Route 1, Section A. M. B. McGowan, Inc., San Francisco, $111,178; Mercer-Fraser Co., Eureka, $108,578; Mittry Bros. Const. Co., Los Angeles $103,162. Contract awarded to Neves & Harp, Santa Clara, $102,658.50.

KERN COUNTY—Between Route 140 and Route 58, about 8.1 miles to be graded and treated with fuel oil. District VI, Route 139, Section A. Griffith Co., Los Angeles, $77,487; Yglesias Bros., Inc., San Diego, $80,564; Union Paving Co., San Francisco, $69,354; Granite Construction Company, Ltd., Watsonville, $78,721; A. Teichert & Son, Inc., Sacramento, $71,182; Dimmitt & Taylor, Los Angeles, $74,118; Hemstreet & Bell, Marysville, $76,133. Contract awarded to George K. Thompson, Los Angeles, $61,905.

LOS ANGELES COUNTY—Between Saugus and Williams Ranch, about 6.7 miles graded and paved with asphalt concrete. District VII, Route 23, Section A.B. Gibbons & Reed Co., Burbank, $78,229. Contract awarded to Griffith Company, Los Angeles, $73,917.90.

LOS ANGELES COUNTY—1 mile east of Los Angeles one 39-foot 6-inch reinforced concrete girder span on concrete piers. District VII, Route 26, Section D. Byerts & Dunn, Los Angeles, $17,332; Const. Engineers, Inc., Los Angeles, $19,236; Jahn & Bressi Const., Los Angeles, $18,968; Craighton, Inc., Los Angeles, $20,682; Weymouth Crowell Co., Los Angeles, $17,696; Jones Bros., Beverly Hills, $18,500; R. H. Travers, Los Angeles, $17,586. Contract awarded to Joseph R. Lippincott, Los Angeles, $16,886.25.

LOS ANGELES COUNTY—Bridge across Ramona Blvd. at Lord St., in Los Angeles, consisting of 2 reinforced concrete slab spans, 50 feet long on reinforced concrete piers and reconstructing existing timber stringer spans on timber bents and concrete footings. District VII, Route 26. Andy Sordal, Long Beach, $24,357; Jerome K. Doolan, Pasadena, $26,468; R. H. Travers, Los Angeles, $25,443; Contracting Engineers, Inc., Los Angeles, $26,193. Contract awarded to Joseph Maiser & David J. Reed, Los Angeles, $23,458.

LOS ANGELES COUNTY—In Long Beach, between easterly boundary of city of Los Angeles and Pacific Ave., 1.8 miles grading, paving asphalt concrete. District VII, Route 60, Section G. Southern California Roads Co., Los Angeles, $134,818; Mundo Engineering Co., Los Angeles, $132,534; Sully-Miller Contracting Co., Long Beach, $125,059. Contract awarded to Griffith Company, Los Angeles, $117,688.50.

LOS ANGELES COUNTY—Bridge across Ramona Blvd. at Morenjo St., in city of Los Angeles, consisting of 2 reinforced concrete girder spans on reinforced concrete abutments. District VII, Route 26. P. J. Akmodzich, Los Angeles, $45,876; J. K. Doolan, Pasadena, $44,865; James Noon, Baldwin Park, $40,980; Sharp & Fellows Const. Co., Los Angeles, $45,689; Weymouth Crowell Co., Los Angeles, $41,500; A. Sordal, Long Beach, $44,413; J. Maiser & P. J. Reed, Los Angeles, $42,000; Lindgren & Swinerton, Inc., San Francisco, $43,323; T. A. Beyer Corp., Los Angeles, $46,048.50; Contracting Engineers, Inc., Los Angeles, $49,160. Contract awarded to Bannister & Field Co., Ltd., and Fred E. Potts Co., Los Angeles, $40,916.

LOS ANGELES COUNTY—Reinforced concrete bridge on Sunset Blvd. across Glendale Blvd. in Los Angeles, consisting of a filled arch having a clear span of 90 feet. District VII, Route 2. Contract awarded to Herbert M. Baruch Corp., Los Angeles, $130,438.20.

MENDOCINO COUNTY—Bridge across south fork of the Eel River, 65 miles north of Willits, consisting of two 183-foot spans on pier and abutments of existing bridge. District I, Route 1, Section K. W. J. Tobin, Oakland, $50,871; Lynch Cannon Engineering Co., Los Angeles, $52,256; M. B. McGowan, Inc., San Francisco, $47,958. Contract awarded to Neves & Harp, Santa Clara, $46,766.20.

MENDOCINO COUNTY—Between McDonald and Yorkville, 1.4 miles grading, surfacing. District I, Route 48, Section A. Kennedy Const. Co., Oakland, $58,443; Contoules Const. Co., San Francisco, $49,356; Larsen Bros., Sacramento, $45,810; Granite Const. Co., Watsonvill, $58,376; Hemstreet & Bell, Marysville, $46,649. Contract awarded to Coats Const. Co. Sacramento, $45,474.

MENDOCINO COUNTY—At Rattlesnake Creek, 0.7 of a mile grading and surfacing approaches to bridge on new alignment. District I, Route 1, Section I. W. J. Tobin, Oakland, $69,274; Coats Const. Co. and M. A. Jenkins, Sacramento, $78,945; Union Paving Co., San Francisco, $94,114; Hemstreet and Bell, Marysville, $72,968. Contract awarded to Hein Bros. Basalt Rock Co., Petaluma, $67,627.30.

RIVERSIDE COUNTY—Between Cabazon and Whitewater, about 2.0 miles to be graded and surfaced with oil treated crushed gravel or stone (plant mix). District VIII, Route 26, Section C. Matich Bros., Elsinore, $90,061; C. O. Sparks, Los Angeles, $90,063; United Concrete Pipe Corporation, Los Angeles, $95,691; Walter Trepte, San Diego, $103,987. Contract awarded to Oswald Bros., Los Angeles, $89,476.

SAN DIEGO COUNTY—Between San Diego and Point Loma, about 2.7 miles to be graded and surfaced with bituminous treated crushed gravel or stone surfacing. District XI, Route 12, Section I. Daley Corporation, San Diego, $65,645; Griffith Co., Los Angeles, $68,200. Contract awarded to Walter Trepte, San Diego, $44,586.

SAN DIEGO COUNTY—Between Encinitas and Oceanside, 10.2 miles graded, paved asphalt concrete. District XI, Route 2, Section B. Sander Pearson and Mundo Engineering Co., Los Angeles, $314,947; Sharp & Fellows Contracting Co., Los Angeles, $335,911; V. R. Dennis Const. Co., San Diego, $327,337; Daley Corporation, San Diego, $352,290; Oswald Bros., Los Angeles, $307,058; Southern California Roads Co., Los Angeles, $369,086; Hanrahan Co., San Francisco, $581,783; Jahn & Bressi Const. Co., Los Angeles, $306,773. Contract awarded to Griffith Company, Los Angeles, $304,154.30.

SAN MATEO COUNTY—In Daly City between School St. and Market St., grading, surfacing crusher run base and bituminous surface treatment, 0.26 of a mile. District IV, Route 2, Section A. Lee J. Immel, Berkeley, $10,190; A. J. Grier, Oakland, $9,484; The Fay Improvement Co., San Francisco, $9,431; A. J. Raisch Co., San Francisco, $8,721; Chas L. Harney, San Francisco, $8,693. Contract awarded to Jack Casson, Hayward, $8,435.

SANTA BARBARA COUNTY—Through Santa Barbara, 3.2 miles grading, paving with asphalt concrete on a Portland cement concrete base and with bituminous macadam surface on a crusher run base. District V, Route 2. M. J. Bevanda, Stockton, $230,953; Griffith Company, Los Angeles, $244,754; P. J. Akmadzich, Los Angeles, $285,772. Contract awarded to J. E. Haddock, Ltd., Pasadena, $211,514.90.

SANTA BARBARA COUNTY—Between Santa Ynez River and Santa Ynez, 2.1 miles to be graded and surfaced with oil treated gravel. District V, Route 80, Section A.B. M. J. Bevanda, Stockton, $45,679; Granite Const. Co., Watsonville, $47,942; J. E. Had-

(Continued on page 32)

Hard Rock Miners at Work in Middle of San Francisco Bay

BELIEVE it or not, 25 hard rock miners and 58 experienced mine laborers are at work on the San Francisco-Oakland Bay Bridge, according to reports filed with Governor James Rolph, Jr., chairman of the California Toll Bridge Authority.

It may seem a far cry from hard rock mining to bridge building, but doubters may take a launch to Yerba Buena Island, in the middle of San Francisco Bay where the State Department of Public Works is building the world's largest bridge, and there they will see a typical mine bored into a solid rock island, with typical miners driving shafts deep into the rock, and hauling the muck out with little steel dump cars, or skips, on a mine railway.

The "mines" are tunnels for the two cables of the San Francisco-Oakland Bay Bridge and several shafts, later to be broken together for the huge vehicular tunnel so wide and high that a 4-story building could be pulled through it upright.

WORKING THREE SHIFTS

Thus far the miners have bored a pioneer shaft, 6 feet by 8 feet, at an angle of approximately 45°, a distance of 125 feet for the south cable anchorage. At the tunnel for the north cable, the 6 by 8 foot pioneer shaft has been bored and blasted to a depth of 84 feet.

Three shifts of hard rock miners, working eight hours a day, but only 30 hours a week, are driving these bores into the sandstone, using compressed air drills and dynamite.

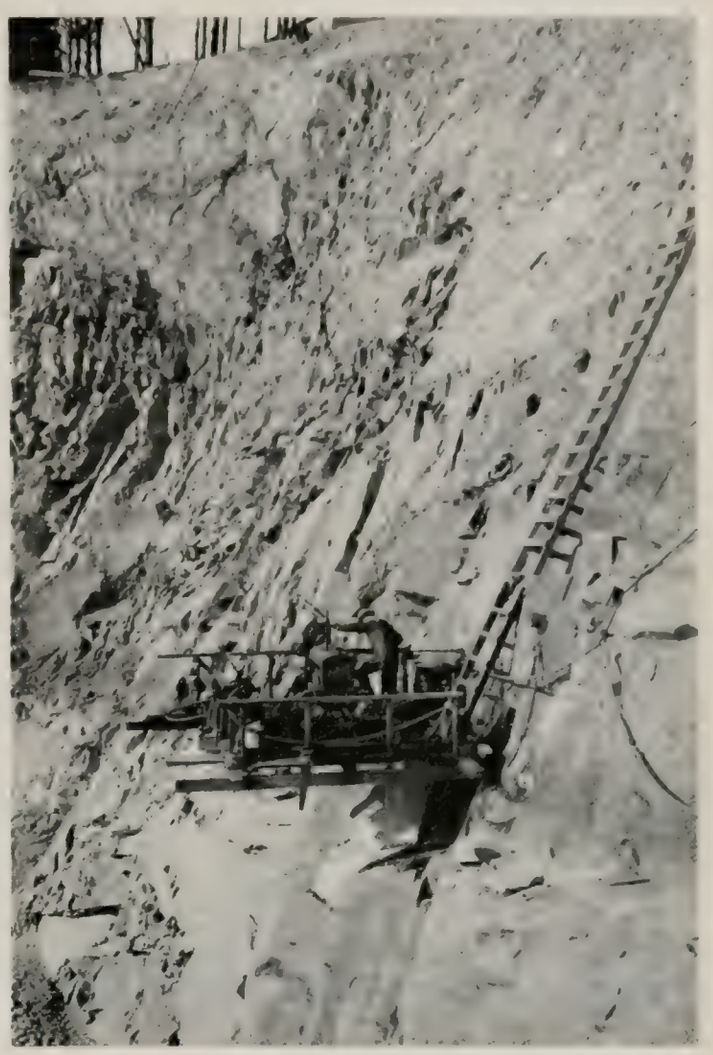
The tunnels, into which the barrel-size cables of the suspension bridge will be anchored, go back a total of 164 feet into the rock. The tunnels are 14 by 27 feet at the mouth and gradually increase in size until, at the end of the shaft, they reach a dimension of 27½ feet wide and 40 feet high.

BORING GROUT HOLES

Other miners are at work boring little 2-inch holes over the crown of the main vehicular tunnel which will be 58 feet high by 78 feet wide and 540 feet long.

Into these holes liquid cement grout is pumped which fills the cracks in the rock and congeals it into a solid mass, thereby preventing cave-ins during the driving of the major tunnel.

Several small tunnels will be bored and then broken into one to make the large vehicular double-deck tunnel to carry the traffic of the bridge through the island, according to plans which have been submitted by Director Earl Lee Kelly to Governor Rolph.



AN AIRY PERCH is provided for this equipment on the face of the west portal of the Yerba Buena Island tunnel where a 200-foot grout hole is being drilled.

BIDS ON BRIDGE PROJECT

On the San Marcos Pass route, bids have been received for the construction of approaches, about 2.1 miles in length, to a proposed bridge across the Santa Ynez River. This project comes under the provisions of the National Industrial Recovery Act of 1933.

NOJOQUI GRADE RELOCATION

Plans are in progress for the relocation of the Coast Highway over the Nojoqui Grade from Las Cruces to 2 miles north of the summit, a distance of 3.7 miles. This work will correct unsatisfactory alignment and grade which form more or less of a bottle-neck with the increase in traffic over the grade. This project comes under the provisions of the National Industrial Recovery Act of 1933.

Agent—Is the boss in?

Proud Father—Yes, he's asleep upstairs in his crib.—*Excavating Engineer.*

Topographic Mapping Work Progressing in Northern Counties

(Continued from page 23)

North Fork of Pacheco Creek was approved by the State Engineer on December 26, 1933.

The application for the Sequoia Lake Dam was approved on December 21, 1933, and the application of the city of St. Helena for repairs to the St. Helena Dam was approved by the State Engineer on December 26, 1933. Civil Works Administration labor will be used on both these dams.

The heavy rainfall over a limited area in the vicinity of Los Angeles on December 31–January 1, apparently did not extend appreciably into the watersheds above major structures as none of the Flood Control District's reservoirs were entirely filled. No damage was done to any of the structures under State jurisdiction.

FEDERAL COOPERATION

Cooperative Topographic Mapping.

Vertical control work was carried on during the month of December on the Paynes Creek Quadrangle in Tehama County and Parksfield Quadrangle in Kings and Fresno counties. Drafting of Colfax Quadrangle in Placer County is in progress.

The final sheets of the Kettleman Plain and Tejon Hills Quadrangles of the U. S. Geological Survey have been published and are now available for distribution. These sheets are published on a scale of 1:31.680 with contour intervals of 5 and 25 feet. The Kettleman Plain Quadrangle covers an area in western Kings County and the Tejon Hills Quadrangle covers an area in western Kern County.

The field work in connection with these quadrangles was carried on in 1930 and 1931 by the U. S. Geological Survey in cooperation with the State of California, acting through the State Engineer's office.

CENTRAL VALLEY PROJECT

The Central Valley Water Project Authority at its meeting held on January 25th resubmitted an amended application for approval of the Central Valley Water Project of California and for grant and loan for its construction under the provisions of the National Industrial Recovery Act of 1933. The original application was filed by Governor Rolph before the formal creation of the Water Authority but the revision was made necessary by an alteration in the amortization schedule and changed requirements of the Federal Government on the matter of outright grants. Both revisions were dictated by the Public Works Administration officials. Many representatives of the State Water Plan Association, irrigation districts and other interested agencies were present. They expressed a desire to contact the Authority at as early a date as possible to discuss the purchase of water and power required by their respective units.

In Memoriam

HARRY E. FEARNALL, Resident Engineer with the Bridge Department of the Division of Highways, died in San Francisco on February 4th after a brief illness.

The Department suffers a distinct loss. Mr. Fearnall served the State well. He had the full faith and trust of his superiors, who reposed in him the responsibility of supervising bridge construction amounting to one and one-quarter million dollars during his seven and one-half years of service.

These important jobs included the following bridges: at Herndon over the San Joaquin River; at San Ardo over the Salinas River; at Bradley over the Salinas River; at Santa Maria over the Santa Maria River and the Big Dann and Cedar Creek structures in Mendocino County.

Mr. Fearnall was born in Stroud, Gloucestershire, England, May 20, 1978, attending the public schools there, and Glengarron and Upland Colleges. He came to America when a youth. Prior to coming to California, he was in private engineering practice in Miles City, Montana, being thus engaged from 1901 to 1906. In 1906 he was appointed County Engineer and Surveyor of Custer County, and in 1908 was elected to that office, serving for sixteen years. As County Engineer he had complete charge of all highway and bridge design and construction. During this time he built four bridges across the Yellowstone River, eight bridges over Powder River and one across the Missouri River. In 1924 he resigned to come to California.

In 1915 Mr. Fearnall was appointed by the United States War Department to draw plans and specifications and to take charge of the construction of an irrigation project for Fort Keogh, Custer County, Montana.

Mrs. Fearnall has the sincerest sympathy of the Department in her bereavement.

Highway Bids and Awards

(Continued from page 30)

dock, Ltd., Pasadena, $45,768; Gist & Bell, Arcadia, $48,737; J. L. Conner & K. Kristich, Monterey, $80,530; L. A. Brisco and John Jurkovich, Arroyo Grande, $43,575; Contoules Const. Co., San Francisco, $54,204; Yalesias Bros., Inc., San Diego, $44,810; Western Motor Transfer Co., Santa Barbara, $53,589. Contract awarded to Macco Const. Co., Clearwater, $41,680.60.

VENTURA COUNTY—Overhead crossing near Ventura consisting of nine 40-foot and two 57-foot reinforced concrete spans and one 94-foot steel span. District VII, Route 2, Section D. R. E. Campbell, Los Angeles, $102,724; M. B. McGowan, Inc., San Francisco, $95,333; Byerts & Dunn, Los Angeles, $89,792; Merritt-Chapman and Scott Corp., San Pedro, $95,033; Andy Sordal, Long Beach, $109,791; Weymouth Crowell Co., Los Angeles, $96,704; Herbert M. Baruch Corp., Los Angeles, $107,660; Sharp & Fellows Contracting Co., Los Angeles, $94,978; R. H. Travers, Los Angeles, $95,209; Lynch Cannon Engineering Co., Los Angeles, $111,206; Clinton Construction Co. of Calif., Los Angeles, $96,375; Bannister Field Co., and Fred E. Potts Co., Los Angeles, $97,471; Theo. A. Beyer Corp., Los Angeles, $100,798; Bodenhamer Const. Co., Oakland, $94,774. Contract awarded to Lindgren & Swinerton, Inc., San Francisco, $83,975.

STATE OF CALIFORNIA
Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.----------Governor

EARL LEE KELLY----------Director

ERIC CULLENWARD----------Deputy Director

MORGAN KEATON----------Assistant Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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FRANK A. TETLEY, Riverside
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C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary

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R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

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A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
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A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
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W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer

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HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

10115 2-34 9M

CALIFORNIA STATE PRINTING OFFICE
HARRY HAMMOND, STATE PRINTER
SACRAMENTO, 1934

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM
1933

LEGEND
Primary Roads
Secondary Roads

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LOS ANGELES AND VICINITY

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS

Scene on State Highway No. 60 Near Santa Monica

Official Journal of the Department of Public Works

MARCH, 1934

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$2,500,000 Deficit in Highway Budget Threatened by Gas Tax Revenue Loss

Shrinkage of 3% to 5% in Monthly Income Since July 1, 1933 Together With Increased Cost of Construction Portends Elimination of Major Projects

By **GEORGE T. McCOY**, Assistant State Highway Engineer

ADVANCEMENT of the State highway construction program by the Division of Highways for the current biennium is threatened with serious handicap by the continued decreased revenues from the State tax on gasoline. Revenues from this source have been falling from 3 per cent to 5 per cent below the estimated returns for each month since the beginning of the biennium on July 1, 1933.

This reduction in income can only result in curtailment of the State program for road construction, which has done so much for the relief of unemployment in California as well as providing much needed improvement to the 14,000 miles of roads which make up the network of the State highway system.

With the situation as it is, a timely review of the Division of Highways budget and the allocation of its funds to the various functions of the division will show the probable extent of the necessary reduction of the program.

GEORGE T. McCOY

The revised Division of Highways budget as adopted and approved by the California Highway Commission on August 5, 1933, provided for construction and maintenance and other functions such as purchase of rights of way on the State highway system amounting to more than $70,000,000 during the period from July 1, 1933, to June 30, 1935.

The budget was predicated upon estimates of revenues from the various sources of State highway funds, based upon studies of previous collections, and upon the Federal apportionment to California for State highway construction of funds appropriated by the National Industrial Recovery Act.

The revenues for the Division of Highways from State sources consist of the following:

1. One-half the net receipts of the motor vehicle license fees.

2. One-half the net re-receipts of the highway transportation tax.

3. Two cents a gallon from the net receipts of the motor vehicle fuel tax, of which one-quarter cent is directly apportioned to maintenance and construction projects within the city limits of incorporated towns and cities.

(Note.—The State motor vehicle fuel tax is three cents but one cent is now turned directly over to the various counties in proportion to the amounts collected within the limits of the particular county.)

ESTIMATED INCOME TOTALS

The anticipated income from the State and Federal sources was estimated at the following figures:

Motor vehicle fees	**$5,356,000**
Highway transportation tax	**600,000**
Motor vehicle fuel taxes	**48,180,000**
National recovery funds	**16,000,000**
Total	**$70,136,000**

While accounting procedure and statute require the monies for State highway pur-

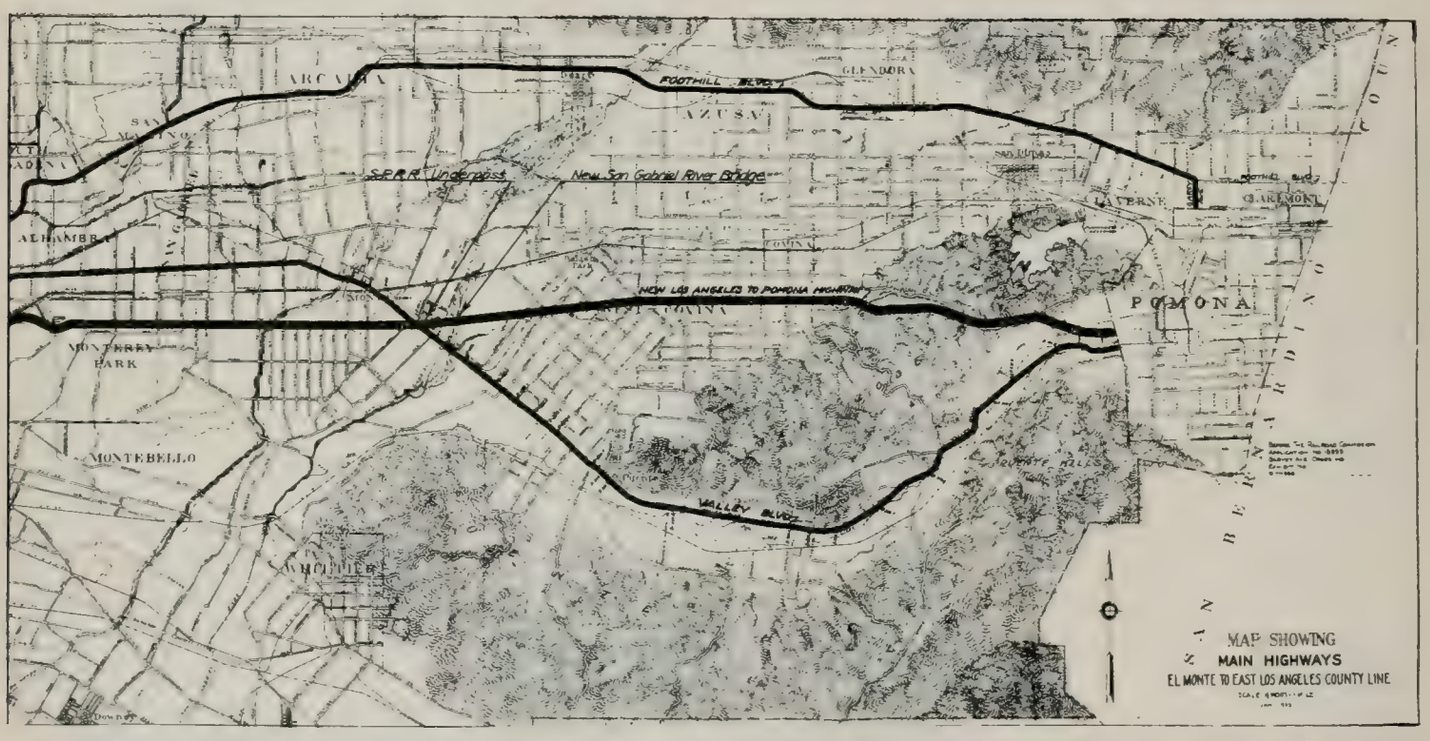
(Continued on page 10)

New $2,119,000 L. A.–Pomona Arterial Will Save Traffic $876,000 Annually

By **S. V. CORTELYOU,** District Engineer

IN THE NEAR future, Los Angeles will have a new State highway entrance from the east—one that will be unique in that the six miles through the suburban area from Monterey Park to the intersection of Aliso Street and Mission Road near the Civic Center of Los Angeles will be practically free from streets or railroads intersecting at grade.

This route will connect San Bernardino, Redlands and Riverside via Pomona and intermediate towns with Los Angeles. In 1931 the State Highway Commission adopted the new route from Pomona to Los Angeles via Holt Avenue and Garvey Avenue, as a State highway layout.



DIRECT ARTERIAL ROUTE between Los Angeles and Pomona now under construction is shown by heavy black line. Lighter black lines indicate existing Foothill Boulevard and Valley Boulevard Routes.

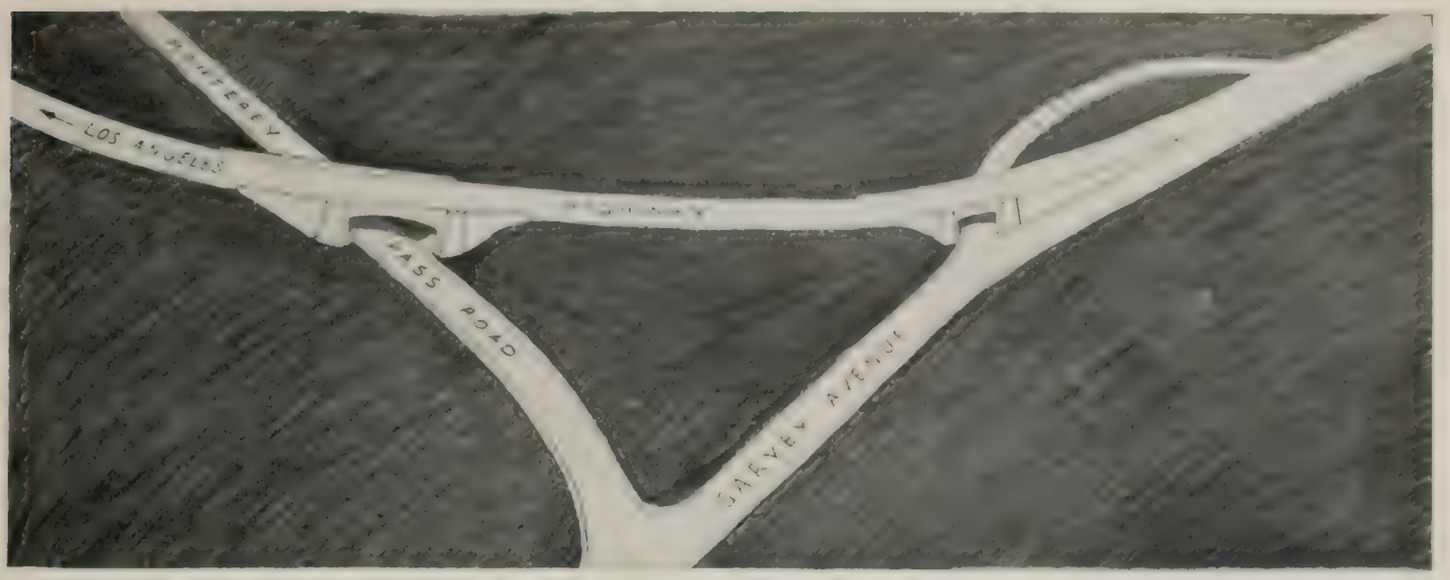
The object of this new route was to provide a main traffic artery on the most direct line easterly from the Civic Center in Los Angeles, utilizing existing highways wherever possible and constructing new sections wherever necessary to maintain direct alignment.

For a great many years, traffic between Los Angeles and Pomona has been carried by two principal routes, one the Foothill Boulevard, by which traffic is routed northeasterly from Los Angeles by way of Pasadena, Azusa, Glendora and Claremont, and finally southerly to Pomona; and the equally devious route known as the Valley Boulevard, by which traffic is carried northeasterly from Civic Center through a maze of intersecting streets and railroad grade crossings past Lincoln Park, thence on a gradual turn southeasterly through Alhambra, El Monte and Brea, and through the long pass between Puente Hills and San Jose Hills, swinging again to the northeasterly to Pomona.

"S" ROUTE BISECTED

This latter route has the shape of a huge "S" which deviates several miles from the direct line. The new route cuts across this "S" in practically a straight line, with a saving in distance of a little more than three miles. The section through San Jose Hills and Kellogg Ranch on the Pomona end, 6.06 miles in length, was let to contract in July, 1932, and completed in May, 1933. It extends from the city limits of Pomona to Barranca Street and connects with Arroyo

(Continued on page 16)



IDEAL GRADE SEPARATION plan of the new Los Angeles arterial permits six miles of modern high standard boulevard through suburban area without a grade intersection. Monterey Pass Road is crossed by an overhead structure and Coyote Pass traffic is handled by a partial separation as shown above, cars moving in southwesterly direction being diverted through an underpass to prevent a lefthand turn across traffic.

MISSION AND MODERNE at once. The graceful lines of the new Monterey Pass overhead bridge structure blend twentieth century engineering with the historic background of the southland.

TYPICAL SECTION of new Los Angeles airline arterial showing wide three-lane pavement with edges of fill protected by berms and white sight posts.

Redwood Puncheons Used for Fills on Realignment Eliminating 205 Curves

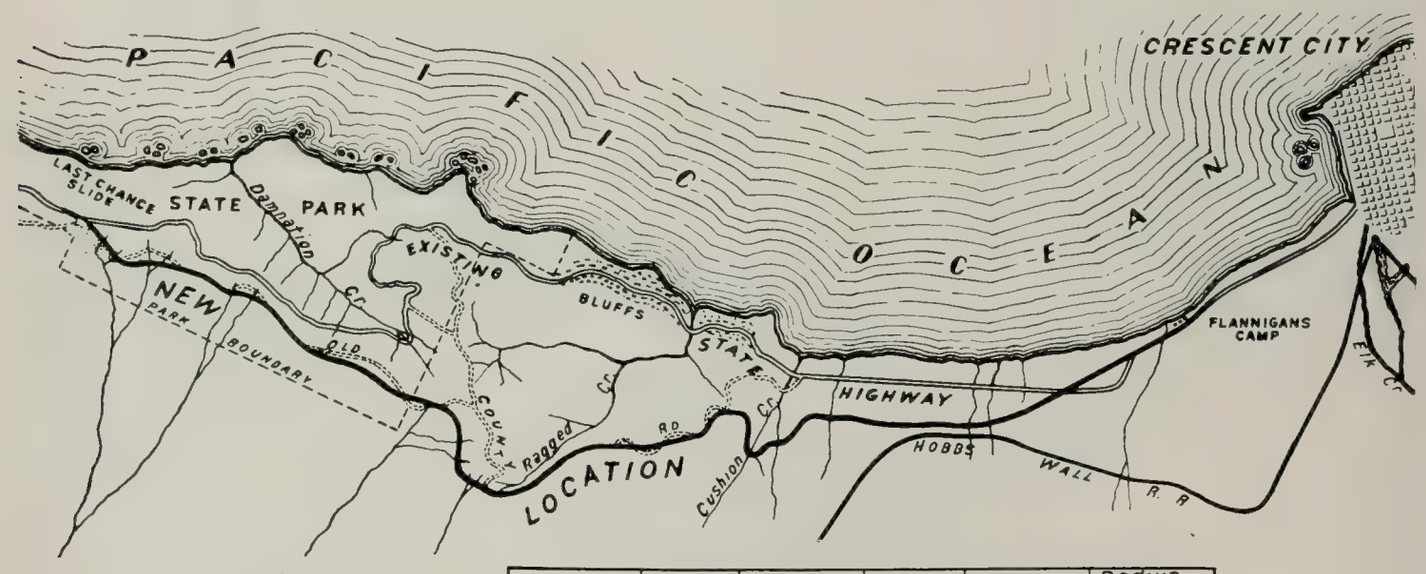
By **J. W. VICKREY,** District Engineer

THE RELOCATION and construction of 9.2 miles of the Redwood Highway in Del Norte County causes only a momentary interest by its cost of $713,683.95 in this day of gigantic engineering projects but elicits more than a cursory interest when the project is thought of as exemplifying the progress in highway transport, construction and beautification made in the past half century.

Forty-six years ago the supervisors of Del Norte County authorized the construction of a road from Crescent City southerly to Requa, on the Klamath River, to connect with a road from Eureka, some 65 miles to the south.

Mail destined for Crescent City was received by boat at Eureka; hauled to within six miles of the Klamath River and then packed on horses to the river. A rowboat transported it to the opposite shore where it was once more loaded on horses and packed to its destination over beach and mountain trail, a trip which in the stormy season required days to make.

Upon the completion of the Crescent City-Requa road, stages drawn by four- or six-horse teams were placed in operation. A fare of $5 was charged and the trip required ten to sixteen hours, dependent upon the weather.



	Length	No. Curves	Degrees	No. Circles	Radius Max	Radius Min.
Present	10.31mi.	239	11076°	30.77	1000	50
Proposed	9.52mi.	34	1519°	4.22	6000	300

MAP SHOWING RELOCATION of 9.9 miles of the Redwood Highway between Last Chance and Flannigan's on the Del Norte County coast south of Crescent City.

This road, placed under construction in 1889 and completed six years later, permitted the first vehicular travel from Crescent City to Requa, at that time a thriving fishing and cannery town.

TRANSPORTATION BY ROWBOAT

Prior to the construction of this road, freight consigned to Requa was received at Crescent City by infrequent lumber schooners and unloaded into large rowboats, which were then rowed by as many as sixteen oarsmen down the coast to the Klamath River and thence to its destination.

The old landmark called "Tub Springs," near the road now under construction, was the stopping place for watering the horses as well as the lunching place for the passengers.

In 1910, an automobile touring car replaced the horse-drawn stage, though the lack of rock ballast frequently required the use of the stage teams to pull the auto-stage through the many deep quagmires. This resulted in the trip often taking hours, whereas now it is made in thirty minutes.

As travel increased, the necessity for some type of surfacing became apparent. Timber

(Continued on page 19)

THROUGH REDWOOD FORESTS lies a portion of the relocated route for the Redwood Highway in Del Norte County. No. 1—Scene on the existing highway along the steep coast where slides occur making maintenance costs prohibitive on a road with too many sharp curves. No. 2—Highway crews are engaged in clearing operations for the new road through heavy timber. No. 3—Part of old Redwood puncheon road through Graves Park built twenty years ago and still in travelable condition. No. 4—Redwood puncheons are being used to take the place of earth fills on portions of the new road, thus utilizing the timber of the few trees it is found necessary to fell.

Winter Experiments in Curing Cement Concrete Result in Recommendations

By **C. S. POPE**, Construction Engineer

COLD weather curing of Portland cement concrete is not ordinarily a problem in California, but from time to time occasions arise where it is necessary to devise means for combating the effects of low temperatures on concrete construction.

During the winter months of 1929, 1931 and 1932, sufficiently cold weather prevailed to make necessary the protective measures described herein.

On a paving project in San Diego County in 1929, temperatures as low as 18 degrees Fahrenheit were successfully combated by the use of a blanket of dry earth three inches thick on the pavement, to which was added a covering of three-ply burlap. By this means the curing temperature was maintained at above 50 degrees Fahrenheit.

C. S. POPE

BITUMINOUS MEMBRANE USED

On paving in the Sacramento Valley during 1932, a different method of procedure was used. Curing was done by the use of bituminous membrane covering with the following additions:

The temperature forecast for the next 24 hours was obtained from the local weather bureau about 4 p.m. If the forecast indicated a minimum temperature above 32 degrees Fahrenheit, a single layer of burlap was used on the current day's run and bituminous curing membrane was applied the following morning. If temperatures below 32 degrees Fahrenheit were indicated, the current day's run was covered with double burlap and a bituminous membrane applied next day.

If the cold weather continued, a single layer of burlap was applied for the next two nights; if the temperature under the burlap was quite low, double burlap was used for three days. The above practice was acceptable only when temperatures of 32 degrees Fahrenheit or less did not exceed a 4-hour period; for such longer cold periods, the provisions of the Standard Specifications prevailed.

WINTER PAVING ON RIDGE

Certain experimental work in curing methods was done at Castaic on concrete paving, but was not conclusive because weather temperatures were not very low and protective measures were somewhat insufficient.

Paving was started on the Ridge Route Alternate on February 14, 1933, and the bituminuous membrane method of curing was used. From one to three-ply layers of burlap were used during cold weather to protect the concrete, and beam breaks were used to determine the proper time before pavement opening, the beams being subjected to the same temperature, etc., as the pavement itself. No concrete was laid on frozen subgrade, and in general the provisions of the Standard Specifications relative to cold weather concreting were complied with.

In connection with this subject, a recent article by H. F. Clemmer, Engineer of Materials at Washington, D. C., brings out the interesting fact that concrete laid in the morning with rising temperature attains greater strength than concrete laid in the afternoon with dropping temperature. In other words, increasing or decreasing temperatures cause increase or decrease in the rate of setting of the cement. He also states that beam tests furnish a valuable check on the quality of concrete.

The strength of concrete obtained under the above curing methods was checked by beam breaks and proved satisfactory.

SERIES OF EXPERIMENTAL TESTS

In view of the fact that information as to the above tests had not been recorded with any great care nor generally disseminated, a

A PAVING EXPERIMENT is here pictured as conducted on the Ridge Route Alternate last winter. Fourteen test sections of cement concrete were cured under different temperature conditions.

more ambitious investigation was undertaken early in 1933 in which the Materials and Research Laboratory and the Construction Department collaborated.

W. H. Mohr represented the Laboratory and prepared the report from which the data quoted is taken, while F. A. Read acted as observer for the Construction Department, the work being under the general supervision of District Engineer S. V. Cortelyou.

The site of the experiment was the Ridge Route Alternate in Los Angeles County. Experimental test sections were constructed at Chandlers during February, 1933. These test sections contained 80 cubic feet of concrete and were made up of two slabs each 4 feet by 20 feet by 6 inches, each slab containing seven divisions 4 feet by 2 feet 10 inches, a total of 14 test sections. Each section was cured under different conditions and observed hourly over a five-day period. The concrete materials used were the same as those in the proposed Ridge Route pavement; water came from Chandlers and was not heated.

THERMOCOUPLES IN CEMENT

Electro-thermocouples of copper and constantan wire were placed in 13 of the sections and the 14th was left exposed in an uncured condition. The ends of the thermocouples were buried about one-fourth inch in the concrete and a Leeds and Northrup Potentiometer was used to measure the potential of the thermocouples, the readings being converted into degrees of temperature. Three inch mercury thermometers were used to measure the internal temperature of the concrete, being imbedded about $2\frac{1}{4}$ inches in oil wells. The relative humidity was recorded by the use of a sling phychrometer.

Hourly observations of weather, wind, air temperature and humidity were made over a five-day period immediately following the pouring of the slabs.

The lowest temperature recorded was 19 degrees Fahrenheit at 6 a.m. and the highest temperature was 62 degrees Fahrenheit. Had the same temperature range persisted over the 35-day curing period which elapsed before cores were tested, the heat-hours at the time of test would have approximated 30,000 units.

VARIATIONS OF COVERING

The coverings used to protect the concrete were as follows:

1. Hopcloth, wet.
2. Burlap, 12-ounce, 1 layer, wet.
3. Burlap, two layers, wet.
4. No cure, dry.
5. Earth blanket, 2-inch, wet.
6. Earth blanket, 4-inch, wet.
7. Ponding, wet.
8. Bituminous membrane on surface and subgrade, dry.
9. Bituminous membrane, dry.
10. Bituminous membrane, 1-inch earth blanket, dry.
11. Bituminous membrane, plus 1 layer burlap, wet.
12. Impervious paper, Type A, dry.
13. Impervious paper, Type B, dry.

(Continued on page 24)

Russian River Highway Costing $1,225,000 Will Be Opened to Public This Summer

By JNO. H. SKEGGS, District Engineer

One of the most scenic sections of the Russian River will be made accessible to motorists by the relocation of the Redwood Highway between Cloverdale and Hopland, eliminating the tortuous Hopland Grade with its many sharp curves and steep grades crossing seven summits. The new highway, following a water-level route along the Russian River, is now under construction and will not be opened to the public until it is entirely completed which, it is expected, will be next August.

THE RUSSIAN RIVER HIGHWAY now being constructed in Sonoma and Mendocino counties, between the towns of Cloverdale and Hopland, is a unit of the State's highway building program that is attracting great popular interest.

Many inquiries as to the type of construction, cost and possible date of completion of this major highway project have been received from the people, especially those of the North Bay counties, and they are looking forward to the time when the entire unit can be opened to traffic and thereby eliminate what has been for years one of the most serious obstacles to a full enjoyment of touring the Redwood Highway. Anyone who is familiar with the topography and scenic attractions of this region can well understand the interest people feel in the final completion of this new routing of the highway along the beautiful Russian River.

JNO. H. SKEGGS

The present traveled highway between Cloverdale and Hopland is over a rough mountainous area wherein the roadway traverses canyons, negotiating high elevations across ridges. The entire line is of very undulating grades and alignment quite inferior to our present day standards. Two major summits are attained, reaching an elevation of 1205 and 1275 feet respectively.

BUGBEAR OF MOTORISTS

The many blind curves and narrow roadway have made this highway sector a traffic barrier to motorists owing to the strain of trying to safely negotiate its many curves, the time consumed and the dangers of collision.

The hazards of passing vehicles and trucks of wide bodies require the constant vigilance of the automobilist to avoid danger, leaving very little time to observe the countryside and the mountain beauties of the interesting terrain.

The new routing along the river will be a great boon to the people of Mendocino County, in particular, because much of their freighting is carried over the highway, and this new road is a water-level grade, following the course of the Russian River. Its completion will remove all mountainous grades from the Redwood Highway.

GRADING COST $672,000

The county seat of Mendocino County, Ukiah, will be brought considerably closer to the San Francisco Bay region through the elimination of heavy grades and a meandering roadway.

Work on this relocation has been under way since February, 1932, when the first contract was awarded for grading 13.9 miles between Cloverdale and Hopland. The contract involved the moving of over 1,400,000 yards of dirt, together with small structures, involving a total cost in excess of $672,000. It was completed and accepted in September, 1933.

The above mentioned contract was only the beginning of the extensive work to be under-

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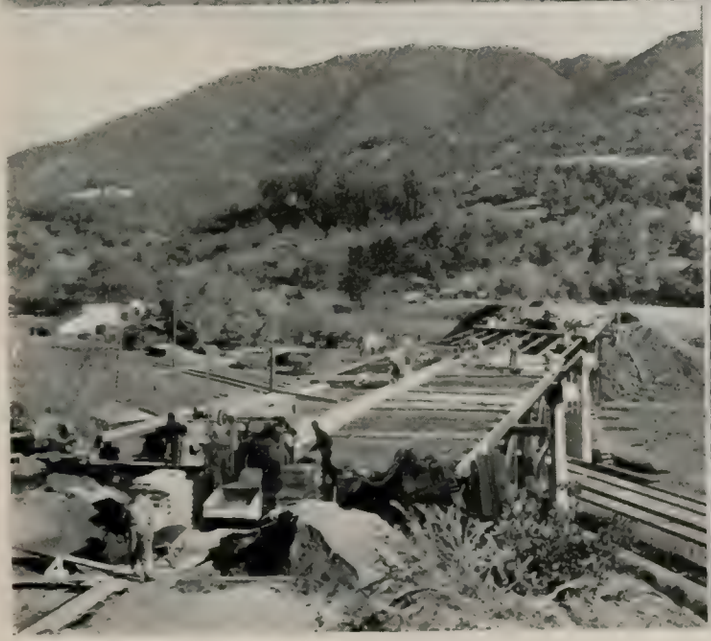

CONSTRUCTION PROGRESS is shown in the above scenes on the Russian River Highway relocation between Cloverdale and Hopland. No. 1—Redwood bridge at Squaw Rock slide. No. 2—Rough graded roadway near Pieta. No. 3—New Russian River bridge under construction showing old covered timber bridge at left. No. 4—Building the overhead crossing above railroad at Preston. No. 5—Hopland overhead crossing structure.

Construction Program Faces Revision

(Continued from page 1)

poses during the 85th and 86th fiscal years to be deposited into four funds prior to disbursement, and the budget as prepared and published is so divided, for the sake of simplicity consideration of the budget here will be based upon the whole without regard to the several funds.

In the preparation of the biennial budget for the Division of Highways the first consideration was given to the maintenance of the entire system. California now has a State road system composed of approximately 14,000 miles of highway and for the general administration and maintenance of this vast network of lines of communication, a sum of $17,000,000 was deducted from the total estimated revenue of $70,000,000.

DIVISION OF GAS TAX

In compliance with the act of the last Legislature alloting one-quarter cent of gas tax funds to cities for street improvement and maintenance, the approximate sum of $5,600,000 was set aside. When these sums were deducted an amount of about $47,500,000 remained for the various functions of construction and reconstruction on State highways.

In compliance with legislative requirements, proper apportionment of these funds is made between primary and secondary routes and between the 13 southern counties and 45 northern counties.

The various functions of highway construction for which funds were allocated are shown in the accompanying tabulation of the whole budget.

CALIFORNIA STATE HIGHWAY BUDGET

Maintenance and general administration	$17,000,000
One-quarter gas tax to cities	5,604,250
Rights of way	3,207,530
Betterments and minor improvements	3,722,000
Joint highway districts	544,635
Contingencies	1,844,627
Major construction projects, including preliminary and construction engineering	38,212,938
Total	$70,136,000

Right of way charges include all necessary expenditures incident to the acquisition of required rights of way. The items of betterments and minor improvements cover expenditures made for various small projects such as elimination of a sharp curve, guard rail construction, widening of short stretches of roadway and many small projects where unemployment relief crews are used.

CONSTRUCTION FUNCTIONS

Joint highway district expenditures cover expenditure of funds specifically allotted by the Legislature to projects coming under this classification and on direct contributions to county projects. Major construction projects include the important work of the Division of Highways in the construction of an adequate road system and which comprise the State highway recovery program.

Of the functions listed under the head of construction and improvement, preliminary engineering includes reconnaissance, surveys, investigations and preparation of plans and specifications for construction; construction engineering covers inspection and superintendence of construction.

From an inspection of the items which make up the budget it is easily discernable that any material decrease in revenue must be borne in the main by the major construction program.

The money budgeted for the construction of these major projects, divided by legislative enactment for work in the 45 northern counties and for the 13 counties of southern California, will probably be trimmed by an amount between $1,800,000 and $2,000,000 if the present decrease of from 3 per cent to 5 per cent of estimated revenue from the gas tax continues.

The $5,600,000 allotted to cities will, of course, bear its share of the reduction, but as this money is apportioned to the cities according to their population, the bulk of the reduction here will be carried by Los Angeles, San Francisco, Oakland, San Diego and Sacramento.

SHORTER WEEK, SAME PAY

In addition to the curtailment of the construction program by the decrease in esti-

30-Hour Week at Full Pay Adds $750,000 to Maintenance Cost

(Continued from preceding page)

mated revenues from the gas tax, the money budgeted for maintenance expenditures was based upon a 48-hour week, but in the effort to relieve unemployment and spread the work among a larger number of men, the working time of all men was reduced to a 30-hour week without a corresponding reduction in weekly earnings, thereby giving employment to more men but requiring approximately $750,000 additional to carry out the maintenance program.

With the decrease in revenue and the reduction in working time for maintenance crews in mind, the most optimistic forecast that seems possible is for a deficit of at least $2,500,000 in the revenues to support the budget for the current biennial period.

In the endeavor of the Director of Public Works and the State Highway Commission to conform to the wishes of the President of the United States in that all construction work possible be placed under contract immediately in order that the present emergency of unemployment be relieved to its fullest extent, practically all work budgeted for the biennial period from July 1, 1933, to June 30, 1935, is being placed under contract this year.

Unless an additional appropriation or allotment of Federal funds is made to this State by Congress, practically all State highway construction as financed under the present budget will be completed before next spring and there will be little or no construction work from that time until the next biennium funds are available in July, 1935.

HEAT TREATMENT OF CLAY SOILS

Experiments are under way in Queensland in the use of a traveling furnace for heating natural soils of heavy clay as it passes slowly over the road. The fusible constituents of the soil are melted. The soil is loosened or dug in front of the machine to a depth as much as 16 inches. After the heater passes, clay or other binder must be added and the surface can then be compacted. The machine in use prepares a strip 12 feet wide. Details of cost are not yet available.

George (attacking piece of chicken): "This must be an incubator chicken."

Sam: "Why?"

George: "A chicken with a mother couldn't be so tough."

SUPER-HIGHWAYS ARE SUPER-ABUSED BY THE SUPER-CARELESS DRIVER

"The super-highway of every motorist's dream is hardly likely to materialize so long as our currently finest expressions of the highway designer's art receive such super-abuse in the form of bad driving."

This declaration of Harold G. Hoffman, New Jersey State Commissioner of Motor Vehicles, was made in commenting on the attitude adopted by many drivers, who when they find themselves on today's finest highways — the super-highway — simply become super-careless.

Commissioner Hoffman declares that this bad accident record, in evidence on Mt. Vernon Memorial Boulevard near Washington and many other famous highways, is to be overcome in New Jersey by a policy of stringent law enforcement. Through this campaign it is hoped, he says, that the "super-careless minority may be taught that the lid is not off with respect to the necessity for common sense and obedience to the rules of safety on even the super-highway."—*United States Daily.*

Workers Get 90 Per Cent of Tax Road Dollar

More than twice as many men were put to work on Federal road projects in the United States during the fiscal year ending June 30, 1933, than in 1932. This was due principally to the $120,000,000 emergency appropriation made in July, 1932, as an unemployment relief measure, according to a Federal report.

Up to June 30, 1933, 107,869 miles of the total of 206,277 miles in the Federal network were completed, while nearly all of the remaining mileage has been improved to some extent by the States.

Although total mileage of Federal-aid roads constructed during the fiscal year of 1933 was less than during the preceding year, it was greater than in any other year. Projects completed totaled 13,255 miles.

In addition to other miscellaneous work by the government Bureau of Public Roads, investigations were conducted in many States on transportation, physical conditions affecting modern highways, and road construction as an employment measure, which revealed that 90 per cent of the taxpayers' road dollar was eventually expended on workers' salaries and wages in addition to stimulating financially many widespread industries, the report states.

Court's Wage Scale Decision Releases $2,000,0000 of Highway Contracts

By **FRANK B. DURKEE,** General Right of Way Agent

An important event of last month affecting the continuance of the intensive program of the Division of Highways for putting men and money to work was the decision of Judge Peter J. Shields, of the Superior Court for Sacramento County, passing upon proper procedure for determining minimum rates of wages on highway projects. An injunction proceeding caused the Director of Public Works to withhold advertising on seventeen projects. No appeal having been taken from Judge Shields' decision denying an injunction, approximately $2,000,000 was released for immediate advertising on budgeted projects in northern California.

PROCEDURE provided by the National Industrial Recovery Act for "establishing minimum rates of wages" on contracts involving expenditure of grants for highway purposes prevails as against the prevailing rate of wages law of California or any schedule of wages set up under a code adopted pursuant to the provisions of the Supplement to the California Industrial Recovery Act.

This was the decision of Judge Peter J. Shields, of Department Two of the Superior Court for Sacramento County, in the case of J. R. Gerhart et al. vs. Earl Lee Kelly, as Director of Public Works, in a nine-page written opinion, filed February 16th. The motion of the plaintiffs for a restraining order was denied and the demurrer of the defendant sustained, with ten days' time granted plaintiffs to amend. Plaintiffs elected not to amend their complaint, and on March 8th filed a dismissal of the action with prejudice to all parties.

ASKED FOR INJUNCTION

The complaint was for an injunction permanently restraining the Director of Public Works from entering into a contract for the construction of a "feeder highway" in the county of San Mateo, and any other highway contracts which do not specify certain schedules of wages, as contended for by plaintiffs.

The complaint, in brief, alleged that on the twelfth day of September, 1933, the Chief of the Division of Corporations approved a code of fair competition for the Excavating and Dump Truck Contractors of Northern California; that the code had been adopted in accordance with chapter 1037 of the Statutes of 1933, commonly known as the supplement to the California Industrial Recovery Act; that set forth therein were schedules of minimum wages to be paid employees engaged in certain of the crafts needed to execute the project in question; that the Director of Public Works had not specified these schedules of wages in calling for bids for the construction of the highway in San Mateo County, but in some instances had specified other and different schedules than those set up by the code.

APPROVED BY U. S. BUREAU

The Director of Public Works had acted in accordance with the California prevailing rate of wages law and the schedule of wages determined upon by him had been approved by the Regional Engineer of the United States Bureau of Public Roads on behalf of the Secretary of Agriculture, as provided for in sections 204 and 206 of the National Industrial Recovery Act. In so acting the Director had taken into consideration the following language contained in section 4 of the "Supplement to the California Industrial Recovery Act":

"Nothing contained in this act shall, however, be construed to repeal or in any way modify the terms of any public works labor law now in effect in this State or heretofore approved, or of any other law for the protection of workers in this State. The provisions of this act shall instead be construed to supplement such laws."

This language, as well as the Federal character of the project, he had assumed, did not require as a matter of course adoption of the code rate of wages for particular highway projects.

The project in question provided for construction of a so-called "feeder highway" in accordance with the authorization of subpara-

(Continued on page 26)

Highway Progress Record in February

Even though State highway work in nothern California was retarded for nearly a month when a court restraining order was served on the Department of Public Works in connection with the code of Excavating and Dump Truck Contractors, the Division of Highways advertised and opened bids on projects totaling over $1,800,000 during the month of February.

BIDS OPENED

County	Location	Miles	Type
Los Angeles	Across Monterey Pass Road and Coyote Pass Road, about one mile south of Alhambra		Grade Separations (2)
Los Angeles	State Street to Mission Street on Ramona Blvd.	1.0	Pavement
Los Angeles	Alameda St. to East City Limits on Serra-Oxnard Highway	0.8	Pavement
Los Angeles	Williams Ranch to 3.5 miles west of Acton Road on Los Angeles-Mojave Lateral	15.4	Pavement
Santa Barbara	Across Santa Ynez River and Santa Agueda Creek on San Marcus Road		Bridges (2)
Ventura	Westerly Boundary to Casitas Pass	2.9	Graded roadbed
Santa Barbara	Across Mission Creek in City of Santa Barbara		Bridges (2)

PROJECTS ADVERTISED

San Diego	Between 1 mile and 6 miles south of National City on Coast Route		Bridges (3)
Siskiyou	Moffett Creek to Forest House	7.5	Bit. tr. surf.
Sacramento	Across American River at Sacramento		Bridge widening (1)
Tulare	Visalia to Merryman	8.1	Pavement
Madera	Hawkins School to Oakhurst	4.1	Graded roadbed
Kern	At Delano on Valley Route	1.1	Bit. tr. surf.
Kern	Sivert to Haypress Canyon on Bakersfield-Mojave Road	6.1	Graded roadbed
Los Angeles	Across railroad spur at Hercules Powder Plant		Grade separation (1)
Stanislaus	Through Turlock	2.3	Pavement
San Bernardino-Riverside	Various locations	608	Traffic stripe
Alameda	East Bay Bridge Approach		Subway (1)
Ventura	Beetox to El Rio Maintenance Station	3.3	Pavement
Los Angeles	On N Street		Bridges (8)
Merced	Westerly Boundary to foot of Pacheco Pass Grade	3.3	Bit. tr. surf.

First Bay Bridge Steel Tower Now in Course of Construction on Pier II

ERECTION of steel began early this month on the first completed subaqueous pier of the San Francisco-Oakland Bay Bridge at the foot of Harrison Street, San Francisco, known as Bridge Pier No. 2. Upon this pier is being erected a 438-foot steel structure, the most westerly of the bridge towers, which with its concrete base will rise to the height of a 40-story building.

By the middle of the month nine huge segments of steel, weighing 1,500,000 pounds and rising 70 feet above the concrete pier had been placed in position.

The lower segments are hoisted into place and fitted on bolts protruding from the concrete. One segment for Tower No. 2 weighed 78 tons and necessitated a specially built steel frame car of heavy construction to transport it from the eastern mills where it was fabricated. This member is 7 feet square, 45 feet long and built of steel one inch thick.

RIVETING TO BEGIN

Each cellular segment fits into another and after several more have been erected riveting will begin. The start of the riveting process is expected by the end of this month, according to Chief Engineer C. H. Purcell.

This Bay Bridg tower consists of two legs of steel, joined and supported by cross bracing extending diagonally from one leg to another. The tower is erected in segments weighing more than 50 tons each. These segments of steel are divided into cells, the walls of which are $1\frac{1}{8}$ inch thick.

Erection of the tower is achieved by a derrick, the main post of which extends up through the cells of a leg of the tower. The height of the derrick is increased as the tower rises. These towers are left hollow and are fitted with ladders inside so that workmen may climb them at any time.

RIVETS VIA PNEUMATIC TUBE

Each segment of the tower has hundreds of holes drilled into it through which hot rivets will be placed to bind the units into a common mass.

The quantity of rivets utilized on the San Francisco-Oakland Bay Bridge will total 650,000 pounds.

The rivet is shot in a pneumatic tube while red hot up to a riveter who, with a pneumatic hammer, drives it into position and crushes the head into the material riveted so that it is virtually welded into place. An inspector follows the riveter and cuts out defective rivets.

LARGEST IN WEST

This will be the largest steel job the West has ever seen, and the $22,000,000 worth of steel purchased for this bridge was the largest steel order ever placed in the United States, according to W. A. Irvin, president of the United States Steel Company, who recently inspected the bridge work in company with Director of Public Works Kelly and Chief Engineer Purcell.

Another of the huge compressed-air, cylindrical dredging-well caissons has been towed into place at Bridge Pier 5, 3400 feet west of Yerba Buena Island, which completes the line of piers in construction in the West Bay channel.

The West Bay crossing, according to the progress report filed with Governor James Rolph, Jr., chairman of the California Toll Bridge Authority, and State Director of Public Works Earl Lee Kelly by Chief Engineer Purcell, shows one subaqueous pier completed, one nearing completion, and three under construction.

BUILDING BIG FILL

The East Bay crossing, having a total of 39 subaqueous piers, now has one deep-water pier completed, two other deep-water piers under construction, four shallow-water piers, resting on piles, completed, and four shallow-water piers under construction.

In addition, work reports from District IV of the Division of Highways, under Colonel John H. Skeggs, show thousands of yards of sand and rock pumped and dumped respectively along the Key Route Mole on the Oakland tidelands to form the wide fill where both decks of the bridge will empty traffic onto a broad artery with 14 lanes of traffic at the toll houses.

A short answer seldom brings a long order—neither does a long-winded one.

UP IN THE AIR goes segment after segment of Tower No. 2 of the San Francisco-Oakland Bay Bridge as great derricks swing aloft the huge crate-like steel units and pile them up like blocks on top of each other. As they are dropped into the place they were made to fit, riveting crews soon fasten them together. Thus the tower is rising slowly and steadily to equal the height of a 40-story building. Nine segments weighing a total of 1,500,000 pounds and towering 70 feet above the concrete base off the foot of Harrison Street, San Francisco, had been placed by March 17.

New Highway Free of Grade Crossings

(Continued from page 2)

Drive which already extended for 3.78 miles through West Covina to Orange Avenue.

A second contract was awarded for constructing a new direct cutoff from Orange Avenue to Mountain View Road which is 4.31 miles in length and extends across numerous walnut and orange groves, the San Gabriel River, and the Southern Pacific Railroad near El Monte. This section connects with the east end of Garvey Avenue at Mountain View Road, a short distance east of El Monte.

14-SPAN BRIDGE BUILT

A new reinforced concrete girder and deck type bridge was constructed across the San Gabriel River on this new alignment. This bridge has an overall length of 964 feet, consisting of fourteen 65-foot spans and two 27-foot cantilever end spans. The width of roadway is 44 feet with two 3-foot sidewalks. Work is under way on an underpass railroad crossing under the Southern Pacific Railroad.

From the end of the latter new section, traffic will be carried on existing wide pavement on Garvey Avenue for 6.5 miles, including the portion within the City of Monterey Park to Atlantic Boulevard. From this point to the intersection of Aliso Street and Mission Road near the Civic Center in Los Angeles is the Ramona Boulevard project, which is actually the final connecting link in this new Pomona-Los Angeles route.

The first 3.8 miles from Atlantic Boulevard to the easterly city limits of Los Angeles is partly on new alignment through the southerly part of the Midwick Country Club, and partly utilizes existing portions of Ramona Boulevard, Cotton Avenue, and Harrison Street.

3-GRADE SEPARATION

On this section there will be three grade separations constructed under separate contracts. These consist of a subway under Eastern Avenue, an overhead bridge across Monterey Pass Road, and a partial separation at Coyote Pass Road where traffic going southwesterly along Coyote Pass Road will be diverted to the right and passed under the highway instead of making a left-hand turn across the traffic.

The first half mile within the city limits of Los Angeles utilizes the existing pavement on Harrison Street which was paved 48 feet wide by the city a short time ago, and extends to Fickett Street, where a new State contract, 0.63 mile in length, extends to State Street. From State Street to Mission Road, still another contract has been awarded for grading and paving a length of 0.96 mile. This contract will connect with Aliso Street at Mission Road, which in turn connects with the Civic Center of Los Angeles.

The alignment on these last two contracts follows along the southerly side of the Pacific Electric Railway the entire distance. By following along the line of the railroad, considerable advantage is gained. In the first place, the railroad is located on the most desirable alignment through this section. In the second place, there are five existing bridges over the railroad tracks at Lord Street, State Street, Cornwall Street, Marengo Street and Soto Street. By lengthening the structures they can be made to span the new highway as well as the railroad and thus serve a double purpose.

FIVE BRIDGES EXTENDED

By this plan, the new highway will have the tremendous advantage of entering the city and extending practically to the Civic Center without a single grade crossing. All of these extensions to existing structures are under contract and should be completed by the time the highway contracts are finished.

Starting at Aliso Street and Mission Road, the new highway will be 64 feet wide between curbs to Fickett Street with a concrete pavement 40 feet wide and 12-foot oiled shoulders. At Fickett Street connection will be made with the new concrete pavement constructed by the city on Harrison Street. This new pavement, 48 feet wide, extends one-half mile to Evergreen Avenue. From Evergreen Avenue to Atlantic Boulevard the improvement will consist of a 40-foot pavement with 20-foot oiled shoulders. From the intersection of Atlantic Boulevard and Garvey Avenue the existing wide pavement on Garvey Avenue will be utilized all the way through Monterey Park.

The new section east of Mountain View Road consists of a 30-foot concrete pavement with oiled shoulders. This standard continues all the way to the west city limits of Pomona where the city placed pavement on

MANY BIG CUTS on Los Angeles-Pomona Highway permit a direct route through hills and wide oiled shoulders give additional width to broad traffic lanes.

Holt Avenue 68 feet wide betweeen curbs. The portion through West Covina on Arroyo Avenue is being constructed on a 100-foot right of way with 30-foot concrete pavement and oiled shoulders.

This new route will serve nearly all of the transcontinental traffic entering Los Angeles from the east, as well as the much larger volume of local traffic from the numerous small towns and communities to the east of Los Angeles.

The length of this route from Mission Road in Los Angeles to the city limits of Pomona is approximately 27 miles as compared with 30 miles on Valley Boulevard, the nearest alternative route.

The cost of the construction work either recently completed by the State or at present under State contract totals $1,742,000. Adding to this the esimated cost of bridge construction and road construction amounting to $377,000 to be undertaken by the State as soon as funds can be made available, which amount is not covered by budget items for the present biennium, will make the State's total expenditures for construction on this route, $2,119,000.

Nearly all of the right of way for this new route, although across highly improved and very valuable land, was donated by property owners. In such cases the State made payment to the owners for such things as productive fruit trees damaged or removed, moving and reconstructing existing buildings, irrigation lines or other private improvements, and payments to utility companies for moving and reconstructing their facilities where they have been located on private right of way at such locations as the highway construction made necessary their removal to new locations.

Since State highway work is done entirely without assessment against abutting property, the benefits occasioned to the property by construction more than offset damages to the property.

The area secured for right of way was so large and the property acquired so valuable that it is conservatively estimated that the market value of the right of way for this route from the Civic Center of Los Angeles to Pomona is $2,000,000.

Traffic studies indicate that the daily volume of traffic over this route in the vicinity of El Monte will be about 20,000 cars per day, with an even greater volume of traffic nearer Los Angeles. With the savings of three miles in distance which will be effected by this new route, and an average operating cost per car, including trucks and buses, of 4 cents per car mile, the annual saving to traffic will amount to $876,000, which would pay the entire construction cost of the project in less than two and one-half years.

The saving in cost of operating expense of cars due to shortening the distance is small compared to increased safety to traffic and the value in saving of time, due to the

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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ..... Director
JOHN W. HOWE ..... Editor

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BETTER HIGHWAYS!

The Federal system of highways is by no means built up to a point that approaches public requirements. There is an impression to the contrary, but it is an erroneous impression.

As a matter of fact the job is only about half done. To finish and rebuild the existing Federal system of roads in accordance with present standards will require quite as much money as HAS BEEN INVESTED THERETOFORE UPON EXISTING MILEAGE.

We are far from completeness or even a tolerably advanced stage in the completion of our vaunted highway system.

Improved farm to market roads and roads designed to supplement transport in and through our municipalities DO NOT BEGIN TO BE WHAT THEY SHOULD BE.

Then there is the great and thoroughly practical conception of through highways from East to West, and North to South.

There is another aspect to this question.

Road building has been done, in the main, HONESTLY, contrasting in this respect with numerous other undertakings which have depended on the cooperation and support of the Federal Government.

As President Warden of the American Association of State Highway Officials recently said:

> **"If all the business in the United States in recent years had been conducted as honestly and had been as well done as this nationwide highway construction there would be no depression."**

Here is a field of public works where the government can proceed with permanent benefit and lasting service to all—both of the present and future generations.'

Why not go "Full speed ahead"?

—San Francisco Examiner.

Unimproved Highways Throughout U. S. Still Total Huge Mileage

THE outlook for highways in this country was changed materially with the passage of the National Industrial Recovery Act, with its outright grant of $400,000,000 to the States for highways and its further provisions for grants and loans. Yet we must realize that the present Federal appropriations will have comparatively little effect on the ultimate completion of our system of public roads when we consider the huge mileage of *unbuilt* highways throughout the Nation. These appropriations will serve chiefly the purpose of giving emergency aid to the unemployed.

At first glance it might appear that the new funds would serve as an offset against the falling-off in local appropriations and funds for highway building. This, however, is not the case. In the middle-western agricultural States, for example, the drastic decline in agricultural commodity prices has resulted in the inability of many of our citizens to meet their obligations, and this has been translated directly into large losses in road funds, against which there are no offsetting balances. Similar conditions prevail elsewhere.

The retrenchment that has been going on is especially unfortunate in view of the standard of improvement of our local highways. The system of local highways, including feeder and farm-to-market roads, comprises 600,000 miles of surfaced highways—slightly more than 20 per cent of the total of 2,700,000 miles. Hard-surfaced mileage amounts to about 2 per cent of this total.

For the past five years the highway construction program in this country, including resurfacing and reconstruction, has amounted to about 55,000 miles annually. The average annual expenditure for this same period has amounted to $1,500,000,000.

The huge mileage of unimproved highways is being reduced by *less than 2 per cent annually.* Reconstruction and resurfacing are already important factors in the improvement program. Yet there are those who would see road expenditures still further curtailed.—*Better Roads.*

"Why do you wear rubber gloves when cutting hair?" asked the customer.

"For the purpose," replied the barber, "of keeping our celebrated hair restorer from causing hair to grow under my finger nails."—*The Excavating Engineer.*

Puncheon Fills Add Rustic Beauty

(Continued from page 4)

being plentiful and readily available, puncheon—planks hewn or split from redwood trees—were placed transversely to the road and served the purpose. This construction, though insuring a stable road surface, resulted in the roughest riding surface conceivable; a ride over it never to be forgotten.

Eventually, the greater portion of this road, within timbered areas, was surfaced with puncheon which at the present time shows little deterioration from its original condition. No difficulty is encountered in driving over the portions of the road in Graves Park. This road, though now relegated to the past, is to be maintained in its original condition as an interesting means of comparison between an old and a new highway.

The construction of a State highway between the county seats having been provided for by the Highway Bond Act of 1909, a highway between Wilson Creek and Crescent City was constructed and opened to traffic in 1920, resulting in the abandonment of the puncheon road that had served the citizens of this section for so long.

WORST REMAINING SECTION

In recent years it became evident that increased traffic on the Redwood Highway would result in an ever-increasing demand for the widening of this portion. During its construction, limited funds necessitated building a very slow standard, which at this time constitutes the worst remaining section of the Redwood Highway.

Reconstruction of the existing road to a standard adequate to present day and anticipated increases in traffic was found to cost more for actual construction than the routing finally adopted. Widening would also result in impairing the impressive beauty of the finest of redwood parks by destroying a great amount of the forest and luxuriant undergrowth.

The route adopted is estimated to cost from $430,000 to $670,000 less for construction and have a much lower yearly maintenance cost than any of the other tentative routes. In addition to avoiding slide areas on the present road along the coast that have increased maintenance costs to prohibitive figures, the new route has only 34 curves with a total of 1519 degrees of curvature having a maximum-minimum radius of 6000-300 compared to 239 curves on the present highway with a total curvature of 11,076 degrees and a maximum-minimum radius of 1000-50. The distance is shortened from 10.31 to 9.52 miles by the relocated routing.

PLAN TO PRESERVE TREES

Having decided upon the location, the design of a modern highway with methods of construction to create as little disturbance or damage to the trees and flora of the forest became of paramount importance.

The knowledge that redwoods buried by freshets or landslides for decades were in a remarkable state of preservation when finally exposed is reflected in the design of embankments in a manner unique in the annals of highway construction and probably never before attempted.

A few giant redwoods from two to seventeen feet in diameter and towering from 250 to 300 or more feet into the sky, that it was found necessary to fell, are being cut into sizes to permit placing of the logs into embankment by power equipment. These logs represent a quantity of lumber sufficient to build 725 six-room homes and when finally placed will be equivalent to more than 30,000 cubic yards of excavation.

The appellation "Redwood Highway" will indeed be applicable to this section upon its completion.

Embankments constructed of these logs merge into the adjacent forest and by eliminating long shallow fills occupy an area much less in extent than the conventional earth fill; also a complete disposal of the 9,800,000 board feet of lumber resulting from clearing operations can be made in the most economical manner.

SYLVAN BEAUTY ENHANCED

By rounding cut-slopes and covering them with top soil, to allow planting or the natural growth of native shrubs or flowers, the road, when completed, will not have destroyed the sylvan beauty of the forest Instead, it will

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Governor Rolph Dedicates Improved State Highway Link Through Anaheim

ONE THOUSAND citizens and school children of Anaheim in Orange County greeted Governor Rolph and his party when he visited that city on February 14th to dedicate and officially open an improved link of State Highway Route No. 2, the Coast Highway, running through Anaheim.

The party was officially welcomed at the north city limits by Philip A. Stanton of Anaheim, member of the California Highway Commission; Mayor C. H. Mann; Assemblyman Ted Craig of Brea; George Reid, Secretary of the Anaheim Chamber of Commerce; Willard Smith, Chairman of Orange County Supervisors; Attorney Thomas L. McFadden and Lotus H. Louden in charge of program arrangements and other State, city and county officials.

The Governor's party included Earl Lee Kelly, Director of Public Works; Edward Rainey, State Superintendent of Banks; Rolland A Vandegrift, Director of Finance; Eric Cullenward, Deputy Director of Public Works; Col. Carlos W. Huntington, Director of Professional and Vocational Standards; E. Raymond Cato, Chief of the Highway Patrol; Joseph Smith of Santa Ana, State Real Estate Commissioner; D. Eyman Huff of Hewes Park, member of the State Fair Board; S. V. Cortelyou, District Engineer, State Division of Highways and William C. McCarthy, Secretary to Governor Rolph.

TRIBUTE TO PIONEERS

The party was escorted to the Elks Club where the preliminary program of speech making was held with the speakers making addresses from the club portico to the large assemblage gathered on the lawn.

Governor Rolph did not touch upon politics, speaking principally upon schools and to the children whom he urged "to take advantage of the opportunity being provided for you by your parents at such great sacrifices." He also paid tribute to the German pioneers who settled Anaheim.

"You will remember," said Governor Rolph, "That when I was elected Governor I promised to put a heart into the office and I can tell you that during the past three years nothing has been needed in that office so much as a heart. I have striven to put a heart into my work."

JOINT HIGHWAY PROJECT

The Governor and his party then proceeded to dedicate the highway improvement on North Los Angeles Street by cutting the tape, officially opening that State highway link to the public.

The highway improvement project consisted of the construction of one mile of asphalt concrete pavement between Sycamore Street and Romneya Drive at a cost of approximately $47,000 and was financed jointly by the City of Anaheim, Orange County and the State. The State contributed about $26,000 and the county and city divided the remaining cost of the project.

This contract was awarded on October 2, 1933, to a Los Angeles company and accepted by the Director on February 20, 1934. It provided for the construction of asphalt concrete pavement 50 feet wide and 0.17 of an inch thick, placed over the existing Portland cement concrete base, between Sycamore Street and La Palma Avenue.

50-FOOT PAVEMENT

Between La Palma Avenue and Romneya Drive, asphalt concrete pavement 50 feet wide and 0.6 of an inch thick, decreasing to 0.5 of an inch in the outer 5 feet, was constructed with 3-foot by 0.5 of an inch Portland cement concrete gutters, a total width of 56 feet, and concrete curbs 1½ feet deep with a width of 0.5 of an inch at the top increasing to 0.81 of an inch at the bottom.

The asphalt pavement was laid in 25-foot strips, the actual paving being started on December 22, 1933, with a crew of about 50 men. One 3-wheel 12-ton roller and two 8-ton tandem rollers were used, with a 25-foot mechanical finisher. About 7600 tons of asphalt pavement was placed at a contract price of $3.63 per ton.

H. B. Lindley acted as Resident Engineer, representing the State, under S. V. Cortelyou, District Engineer.

Pompous Physician (to man plastering defective wall): "The trowel covers up a lot of mistakes—eh?"
Workman: "Yes, guv'nor—and so do the spade."

A CUTTING MOMENT is pictured above when Governor James Rolph, Jr., severed the tape across North Los Angeles Street in Anaheim officially opening an improved link of the Coast Highway through the city. At Governor Rolph's right is Assemblyman Ted Craig of Brea and at his left (the smiling gentleman holding a cane and cigar) is State Highway Commissioner Philip A. Stanton of Anaheim. Others in the group are Mayor C. H. Mann, Secretary Reid of Anaheim Chamber of Commerce, William McCarthy, Secretary to the Governor; Director C. W. Huntington of Professional and Vocational Standards, and District Engineer S. V. Cortelyou.—*Photo by Long Beach Press Telegram.*

BEFORE AND AFTER views of the improved link of State highway through the city of Anaheim. At left is the newly paved and widened North Los Angeles Street, now a fine broad thoroughfare. At right is the old street narrowed by encroachments and obstructions.

CANE MAT FOUNDATIONS FOR ROADS

A township in western Netherlands, which lies below sea level and where the soil is unstable mud of unknown depth, has had difficulty in getting permanent road beds to carry heavy traffic in the bulb districts. A trial section has been built using reed mats after their successful use in a railroad grade. The canes, or reeds, are very resistant to rot, having been used for roofs some of which have been in service for 250 years.

The reeds are impregnated with creosote, then woven into mats two inches thick. Drain tile are laid in the soil, a 2-inch layer of sand is placed on the subgrade, then the mats are placed and the surface is completed with brick filled with asphalt. The section of road will be opened in October and as there is heavy truck traffic, it is expected that the suitability of this type of road will be determined at an early date.

"Before we were married, Henry," said the contractor's wife reproachfully, "you always gave me the most beautiful Christmas presents. Do you remember?"

"Sure," said Henry cheerfully, "but my dear, did you ever hear of a fisherman giving bait to a fish after he had caught it?"—*Excavating Engineer.*

State Highway Winter Traffic Count Shows Marked Gain over 1933 Figures

By **T. H. DENNIS**, Maintenance Engineer

THE TENTH annual winter traffic count on State highways was taken Sunday and Monday, January 14 and 15, 1934. In line with regular practice, the count was taken for a sixteen-hour period, from 6 a.m. to 10 p.m. each day.

The count this year was more extensive than any other ever taken. Some 400 stations were added to cover the 6041 miles of new secondary roads which came into the State highway system in August. In addition, some 1400 stations located on county roads and city streets were selected as part of a state-wide traffic study. The cities included in the count were as follows:

San Diego	Ventura
San Francisco	Eureka
Stockton	El Centro
San Luis Obispo	Bakersfield
Santa Barbara	Hanford
Palo Alto	Susanville
San Jose	Glendale
Santa Cruz	Huntington Park
Redding	Inglewood
Vallejo	Long Beach
Santa Rosa	Modesto
Alameda	Red Bluff
Woodland	Visalia
Berkeley	Marysville
Oakland	Los Angeles
Chico	Pasadena
Colusa	Pomona
Richmond	Santa Monica
Crescent City	South Gate
Fresno	Whittier
Riverside	Ukiah
Sacramento	Salinas
Needles	Orange
Redlands	Santa Ana
San Bernardino	Auburn

The work included not only the taking of density counts but also information from which to develop origin and destination details.

STATE-WIDE TRAFFIC STUDY

The state-wide traffic study is being carried on to develop information as to the comparative traffic use of the primary, secondary, and feeder roads in rural areas as well as in urban territory. This study will also include economic factors which affect the transportation problem. It is expected that the information developed will be of immense value in State planning for the future.

The study is being made under the direction of the Maintenance Department and the field supervision of the traffic counts is handled by the maintenance organization. The count was made possible only through the cooperation of the Federal government in furnishing some 10,800 C. W. A. men for a three-day period. The Saturday before the count was used in organizing and training this force. The State Chamber of Commerce, the automobile clubs and city and county governmental authorities have given their whole-hearted support to the project.

Plans are under way for another count to be taken April 1 and 2 at the same group of stations as in January. It is hoped, also, that another complete count can be taken in July. If Federal forces are not available at that time, counts will be taken at all of the State highway stations and at as many key stations on county roads and city areas as conditions will permit, in order to tie in the peak traffic period of the year.

TWO YEARS COMPARED

The analysis of the information is now under way employing 120 people, 79 of whom are furnished through a Civil Works project.

It is not possible at this time to give out any information as to the main study, but a summary presented herewith has been prepared in the usual form, giving the comparative winter traffic for 1933 and 1934 for the State highway system. The increase or decrease, with respect to various classes of routes, is given below for the old State highway system:

Per Cent Gain or Loss for 1934 Count as Compared to 1933

	Sunday	Monday
All Routes	**+3.4%**	**+15.3%**
Main North and South Routes	**No change**	**+12.4%**
Interstate Connections	**+9.1%**	**+24.4%**
Laterals Between Inland and Coast	**—1.7%**	**+13.3%**
Recreational Routes	**+1.7%**	**+13.8%**

(Continued on page 30)

Unless additional heavy rain and snowstorms of more than ordinary magnitude occur during this month of March the State faces a water shortage next summer according to information and data collected by the State Engineer's office.

A rough check of snow and precipitation to date in the Sacramento and San Joaquin valleys indicates water conditions in those areas will be very similar to the excessively dry years of 1924 and 1931. Similar conditions confront the southern parts of the State where the snowfall has also been meager.

Up to February 10th, the flow of the Sacramento River at Sacramento was 10,000 second-feet or less. Additional rainstorms in the latter part of February brought the flow up to 40,000 second-feet.

News of the irrigation districts, flood control and reclamation, dam investigations and other activities of the division are given in the monthly report of State Engineer Hyatt as follows:

At an election held February 9th on the formation of the North Fork Irrigation District, Modoc County, a majority of the votes cast was in favor of organization.

A $250,000 bond issue was voted by the West Stanislaus Irrigation District on January 2d. This issue is to be used to secure a Federal loan under PWA of funds for concrete lining and other work on the distribution system of the district.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Under CWA Project No. 502 in Sutter County, a gang of nine men and a foreman have been engaged in clearing drainage ditches and other incidental work, with one additional man in our Sutter shop caring for tools.

In Sacramento County under CWA Project No. 502, clearing in the American River overflow channel has been completed to the extent of 2400 man hours. On a recently approved application for continuance of this work for 3000 additional man hours, work was commenced on February 20th. This crew is working 24 hours per week on the reduced schedule.

Sacramento Flood Control Project—Bank Protection.

Work under the State-Federal cooperative program for permanent bank protection has continued under the U. S. Engineer Office at Sacramento. Work is now being done at Eldorado Bend in Reclamation District No. 108 and in Reclamation District No. 1500.

Sacramento Flood Control Project—Construction.

The work of removing certain portions of the old Feather River levee on the left bank between Starr Bend and Bear River has been temporarily discontinued on account of the weather, the work being approximately 90 per cent complete.

Russian River Jetty.

The weather has continued severe during this period, but no damage has been done to the jetty, although some sand has been washed on the track interfering with the operations. The crew under CWA Project No. SLF 70 has worked only 15 hours per week and was discontinued on February 15th at the termination of the program. Application has been made for a continuation of this work.

Mokelumne River.

Clearing in the channel of the Mokelumne River from New Hope bridge to Woodbridge in San Joaquin County has continued under the direction of this office, with a San Joaquin County CWA crew of 100 men.

Pajaro River.

It is expected that work will be commenced within the next few days on clearing in the channel of the Pajaro River under CWA Project No. 502, with a crew of 60 men, supervised by this office.

WATER RIGHTS

Supervision of Appropriation of Water.

During the month of January 37 applications to appropriate water were received, 15 were denied and 20 were approved. During the month 12 permits were revoked and the rights under 3 were confirmed by the issuance of license.

Included among the larger permits which were issued was one to Turlock Irrigation District allowing a diversion of 800 cubic feet per second from Tuolumne River at an estimated cost of $50,000 for the irrigation of 181,556 acres, and a second issue to Canyon Placers Incorporated allowing a diversion of 50 cubic feet per second from Canyon Creek in Trinity County at an estimated cost of $150,000.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

During the latter part of January and until about February 10th the flow of the Sacramento River at Sacramento was 10,000 second-feet or less. Since

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Cement Concrete Tests Made on Ridge

(Continued from page 7)

Tests of covering 1 and 3 were made on 7-sack concrete.

Three cores from all specimens were taken for crushing at 35 days.

TEST OBSERVATIONS

Core strengths at 35 days show the following results listed in the order of breaking strengths.

Method of curing	Compressive strength lbs/sq. in.	Per cent
* 1. Hopcloth	4,243	106
8. Bituminous membrane on surface and subgrade	3,990	100
* 2. Burlap, 12-ounce, 1 layer	3,950	99
6. Earth blanket, 4-inch	3,845	97
9. Bituminous membrane	3,773	95
10. Bituminous membrane, plus 1-inch earth	3,492	88
5. Earth blanket, 2-inch	3,453	87
11. Bituminous membrane, plus 1 layer burlap	3,400	85
7. Ponding	3,286	82
12. Impervious paper, Type A	3,165	79
3. Burlap, 2 layers	3,050	76
13. Impervious paper, Type B	2,977	75
4. No cure	2,351	59

Tests marked thus * are 7-sack concrete.

BRIDGE DEPARTMENT METHODS

The problem facing the bridge department in cold weather curing is somewhat more difficult than the ordinary problem of protecting a paving slab, and the following description is therefore of interest:

Four bridges were constructed on the Ridge Route Alternate during the winter of 1932–33, prior to the construction of the thirty-foot pavement on this new route. At an elevation of 4000 feet on the old route, winter blizzards occurred during which automobile traffic was stalled in heavy snows having a maximum depth of five feet; on the new route, however, less than two feet of snow fell.

The bridges were steel deck plate girder spans on reinforced concrete piers and abutments, the piers varying from 39 to 67 feet in height, thus offering considerable surface exposure to cold weather.

HEAT PROVIDED BY FIRES

Heavy forms were used consisting of 2-inch T & G lumber built barrel stave fashion for each pier; concrete was poured in two days and forms removed the following day.

Mixing water was heated by passing pipes through wood fires, raising the temperature to about 150 degrees Fahrenheit and the concrete in the forms to about 65 degrees Fahrenheit, thus insuring proper chemical action in the setting of cement. Additional protection for curing was required, and tarpaulins hung on bracing scaffolds enclosed each pier. Heat was supplied by coke salamanders under the tarpaulins and thermometers were used to record the curing temperature. Heating was continued until the concrete developed about one-fourth of the required 28-day breaking strength.

For the concrete decks, curing methods developed on the adjacent paving project were used. A bituminous membrane was applied, covered with burlap, thus protecting the surface against evaporation and temperature drop. It was believed that the black bituminous membrane absorbed more heat from the sun's rays during the day than plain concrete, and the burlap helped prevent radiation of this heat during the night.

SATISFACTORY AT NIGHT

This method of curing was found satisfactory with night temperatures as low as 20 degrees Fahrenheit, during clear weather. Due to the exposed decks, the tarpaulins were allowed to hang over the edges, while the heating below by salamanders was continued until proper strength was developed as for the piers.

CONCLUSIONS REACHED AS RESULT OF TESTS

Unsatisfactory concrete will result under any method of curing tried in the above tests where concrete is placed in locations where the temperatures fall below 20 degrees Fahrenheit at any time.

Black curing membranes increase the heat absorbed by the concrete during the daylight hours, and where covered at night with an insulating medium such as dry burlap or dry earth, the heat is retained in the concrete and thus increases its strength.

Ponding or curing with wet burlap prevents the sun's rays from warming the concrete and induces evaporation which lowers the temperature and delays proper curing.

Piru Bridge Piers Cured by Fire Heat

(Continued from preceding page)

COLD WEATHER CURING by covering piers with tarpaulins and heating with salamanders.

RECOMMENDATIONS MADE

It is recommended that no concrete work should be planned for conditions where temperatures will go below 32 degrees Fahrenheit during the curing period. Under emergency conditions, means should be taken to insure heating the aggregates and the maintenance of sufficient warmth in the concrete during the first five days after laying to secure adequate curing. A usual method is to cover the concrete paving with impervious paper or canvas stretched over frames at a sufficient height to allow lanterns or other heating units to be placed under the blanket.

The standard specifications of the California Division of Highways provide that no concrete may be mixed or placed while the air temperature is at or below 35 degrees Fahrenheit unless adequate means are employed to heat the aggregates and water and satisfactory provision has been made for protecting the work.

All concrete must be effectively protected from frost action for a period of five days and it will not be accepted until after thirty days during which the temperature does not fall below 40 degrees Fahrenheit. All concrete which may become damaged by frost action shall, upon written notice from the engineer, be replaced by the contractor at his expense.

FINISHED PIERS after removal of tarpaulins

U. S. Law Controls Federal Fund Job

(Continued from page 12)

graph A (2) of section 204 of the National Industrial Recovery Act, and as such was to be financed in its entirety (except for certain rights of way) with Federal funds.

The Director, in response to the order to show cause why an injunction should not issue, demurred to the complaint and also filed affidavits setting up the facts, particularly that the proposed contract was to be financed by a Federal grant.

The complaint was filed originally in the Superior Court at San Francisco, but was moved to Sacramento by stipulation of the parties.

The case was argued before Judge Shields on January 29th and in addition to the oral arguments lengthy memorandums of points and authorities were submitted by both sides.

In support of the complaint, counsel for plaintiffs raised, among others, the following points:

PLAINTIFFS' POINTS

1. That the Director of Public Works, in fixing a wage scale different from that set forth in the code of fair competition for the Excavating and Dump Truck Contractors, acted contrary to the method prescribed by law for performing his duty, i.e., that since the code had the effect of law, the code rate of wages became the legal rate and was necessarily the prevailing rate of wages.

2. That since the California Industrial Recovery Act was by its provisions made supplemental to other labor laws of the State of California, it fixed additional requirements to be met by the defendant in determining what is the prevailing rate of wages.

3. That since the code of fair competition for the Excavators and Dump Truck Contractors contained a collective bargaining agreement as to wages, this agreement of employers and employees became binding upon the defendant as the prevailing rate of wages.

IRREPARABLE INJURY ALLEGED

4. That the defendant could be legally enjoined because his action in attempting to enter into the contract in question constituted a public nuisance under the supplement to the California Industrial Recovery Act.

5. That the plaintiff unions in their membership would suffer irreparable injury and destruction of property rights if defendant were not enjoined.

6. That a trade union is adversely affected and specifically injured by violation of a State code of fair competition.

As opposed to these contentions W. R. Augustine and Lucas E. Kilkenny, Deputy Attorneys General, and the writer, appearing as counsel for the Director of Public Works, urged, among others, the following objections to the action:

OBJECTIONS BY DEFENDANT

1. That all laws of the State of California inconsistent with sections 204 and 206 of the National Industrial Recovery Act have been specifically suspended by chapter 1041 of the California Statutes of 1933. (This chapter assented to and accepted the provisions of Title II of the Federal act and declared it to be the policy of the State of California to cooperate fully with the United States government in carrying out its provisions.)

2. That the California Industrial Recovery Act and the supplement thereto have no application whatever to the San Mateo project because of its Federal character.

ACTED AS FEDERAL AGENT

3. That the State of California is merely an agent of the Federal government in carrying out the purposes of the latter in connection with unemployment relief and that, therefore, a State court was without jurisdiction of the defendant or the subject matter of the action.

4. That the duty of predetermining the prevailing rate of wages, or a minimum rate of wages which would be "just and reasonable" and "sufficient to provide * * * a standard of living in decency and comfort" as required by the Federal law, devolved upon the Director of Public Works and that such determination requires affirmative action by him and must be made for the locality in which the work is to be performed.

5. That the locality in which the work is to be performed referred, in the particular case, to the county of San Mateo; whereas the rate of wages set forth in Excavators and Dump Truck Contractors Code had been fixed for the entire northern portion of the State without reference to any particular locality.

APPROVED BY U. S. BUREAU

6. That the predetermination of the Director had been submitted to and approved by the United States Bureau of Public Roads on behalf of the Secretary of Agriculture, and that, therefore, a binding agreement relative to the project was in effect as between the State and the Federal government.

7. That the supplement to the California Recovery Act by its language specifically excepted the California prevailing rate of wages law from its operation.

Judge Shields' opinion was confined almost wholly to a discussion of the character of the relationship of the State and the Federal governments in connection with the expenditure of highway funds made available by the National Industrial Recovery Act. He expressed the view that, in such cases, the State is merely an agent of the Federal gov-

CELEBRATING THE TWENTY-FIFTH ANNIVERSARY of the passage of the act establishing the California Highway Commission, this picture was taken of the present commissioners and engineering personnel. Seated, left to right, Commissioners Dr. W. W. Barham, Frank A. Tetley, Harry A. Hopkins, Chairman; Timothy A. Reardon and Philip A. Stanton. Standing, left to right, Secretary John W. Howe, George N. Cook, Secretary Division of Highways; State Highway Engineer C. H. Purcell; Director of Public Works Earl Lee Kelly; Assistant State Highway Engineer G. T. McCoy and L. V. Campbell, Engineer of City and Cooperative Projects.

State Law Held Not Applicable

(Continued from preceding page)

ernment. Discussing this phase of the situation, the opinion reads, in part:

"It is not denied that 'provisions establishing minimum rates of wages' were 'predetermined by the State Highway Department.' It is not denied that the rates recommended to and approved by the Secretary of Agriculture were such as insured 'that all employees shall be paid just and reasonable wages which shall be compensation sufficient to provide, for the hours of labor as limited, a standard of living in decency and comfort.' The government was spending its own money. It required that fair and just treatment should be given to labor by any State agency disbursing its funds. It provided how such fair treatment might be arrived at through the fixing of minimum rates of wages.

Grave doubts exist in my mind as to the power of this court in a collateral proceeding at the instance of a citizen of this State to invalidate a Federal contract and to defeat a Federal project already organized under the provisions of an act of the Congress of the United States. * * * I do not believe that either the code schedule of wages or the 'public wage law' apply to this situation. * * *"

Further on in the opinion Judge Shields says:

That the State Highway Department was the agent of the Federal government in this matter is beyond question. * * *

Section 2 of chapter 1037, Acts of 1933, * * * authorizes the President of the United States to 'utilize such State officers and local officers, etc., as he may find necessary in the administration and enforcement of the said act, and prescribes their authorities, duties, and responsibilities' * * *. The Highway Department was 'utilized' and its 'authority' prescribed in sections 204 and 206 (of the National Industrial Recovery Act) above referred to; and in doing what it did, I am convinced that it was controlled only by these provisions. * * * Neither the defendant nor the Highway Department had anything directly to do in fixing the code rates. * * *

There is a conflict as to the means by which they (schedules of wages) are fixed between a code rate fixed by a group or industry and a rate to be fixed by the Department of Highways, either under the State 'public wage law' or as an agent of the Federal government. In such a case the State law is 'suspended.' * * *

If the Department of Highways is forced to submit to a rigid, inflexible rate prescribed by a code, and the Federal officials deem the rate too high or too low, or too high or too low in one particular, there is no room for adjustment; the Federal government must surrender its discretion at the mandate of a State law or for a small difference be obligated to abandon a vast and important project.

Water Shortage this Summer Predicted in Sacramento Valley

(Continued from page 23)

February 10th there has been an increase to about 40,000 second-feet.

Salinity sampling was reestablished at three stations early in February. These stations are Bullhead Point, Collinsville and Antioch. Tests of February 6th showed 8 parts chlorine per 100,000 parts of water at Collinsville and 5 parts at Antioch.

A rough check of snow and precipitation to date in the Sacramento Basin indicates conditions very little better than in the very dry years of 1924 and 1931. Therefore, if additional storms of considerable magnitude do not occur in late February and in March there is the prospect of a water shortage in the summer of 1934.

DAMS

The activities during the past month in the northern part of the State have been confined primarily to the regular maintenance inspections and the supervision of the repair work which is under way. In the south, in addition to this type of work, inspections have been made of the construction work on the following major projects: San Gabriel Dams Nos. 1 and 2, Pine Canyon Dam, Bouquet Canyon Dam and the El Capitan Dam.

Cooperative Topographic Mapping.

Horizontal and vertical control work were carried on during the month in Monterey and Kings counties and topographic mapping in Kings County. Some office work was done also on the Colfax and Lakeport Quadrangles in Nevada, Placer and Lake counties.

WATER RESOURCES

South Coastal Basin Investigation.

During the month field work continued in a routine way. Annual report on water levels was completed and is being mimeographed.

Bulletin 43 "Value and Cost of Water for Irrigation in Coastal Plain of Southern California" and Bulletin 44 "Water Losses Under Natural Conditions from Wet Areas in Southern California" came from the press. The former was prepared under a cooperative agreement between the College of Agriculture, University of California, and the Division of Water Resources. The latter is a report of a cooperative investigation on the above subject and is divided into two parts, the first being by the Division of Irrigation, Bureau of Agricultural Engineering, United States Department of Agriculture, and the second by the Water Resources Branch of the United States Geological Survey.

DECLINE OF HIGHWAY TRAFFIC

"Use of highways has declined less on account of the depression than almost any other activity. Returning business activity, increasing employment and generally improved economic conditions will result in an early and rapid increase in the demand made by the public on the highway facilities."—*Ohio Public Works.*

U. S. BUREAU REPORTS 17,647 MILES OF ROAD WORK UNDER WAY IN 1933

Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads, in summarizing the work undertaken to the end of 1933 on public works highways by the States under the supervision of the Bureau reported a total of 17,647 miles of construction at an estimated cost of $273,849,184. Of these roads, 9822 miles are on the Federal-aid system outside of municipalities, 964 miles are extension of such roads into and through cities, and 6861 miles are secondary or feeder roads. The mileage, by types of construction, is as follows:

Type	Miles
Graded and drained	4,149
Sand clay, treated and untreated	1,128
Gravel, treated and untreated	6,291
Macadam, treated and untreated	442
Low-cost bituminous mix	1,801
Bituminous macadam	461
Bituminous concrete	706
Portland cement concrete	2,521
Block	63
2431 bridges and approaches	72
159 railroad-highway and between-highway grade separations	13

Employment of men on this program, beginning in August, reached a total of 132,000 men continuously employed in November. The total number of men employed including labor turnover was 236,000. This does not take into account the auxiliary industrial employment.

L. A.—POMONA HIGH SPEED ROUTE

(Continued from page 17)

elimination of grade crossings and traffic delays on the new route. It is conservatively estimated that there will be an average saving of 20 minutes per car which would amount to an annual saving in time of 2,400,000 car hours. As the average car will probably contain more than two persons, the annual saving in time would amount to the time of one person for approximately 5,000,000 hours.

The result of this project will be to furnish a high speed highway from Pomona and intermediate points in practically a straight line to the city of Los Angeles, free from railroad grade crossings and with a minimum number of intersecting streets, which will provide the greatest safety and saving of time possible for such a route. The entire route should be opened to traffic by the first of next year.

Five Bridges Under Construction

(Continued from page 8)

taken, and with its completion the Commission proceeded to award five separate contracts for structures as follows:

FIVE BRIDGE STRUCTURES

1. A bridge across Russian River at Preston, 337 feet long, consisting of one 150-foot through steel truss span; two 38-foot 3-inch steel beam spans, and three 37-foot steel beam spans with concrete deck on concrete piers and one 5-foot sidewalk. This bridge replaces an old and narrow covered wooden bridge.

2. Overhead crossing over the tracks of the Northwestern Pacific Railroad at Preston, consisting of one 63-foot steel girder span over the tracks and 14 timber trestle approach spans all with concrete deck and 34-foot roadway.

3. A bridge across Russian River, two miles south of Hopland, 1136 feet long with 34-foot roadway and concrete deck, consisting of one 248-foot steel truss span on concrete piers and 21 steel girder spans supported by reinforced concrete pile bents and two concrete abutments.

4. Overhead crossing over Northwestern Pacific Railroad near Hopland, 341 feet long with 34-foot deck and concrete roadway, consisting of one 32-foot steel girder span on concrete piers and 15 timber approach spans on pile bents and framed bents with concrete pedestals.

5. A bridge across Feliz Creek at Hopland, 344 feet long, consisting of nine 38-foot steel stringer spans with concrete deck on concrete pile bents and 34-foot roadway.

Running concurrently with the building of these major structures, another contract was put under way covering the placing of crusher run gravel base on the previously completed graded roadway. This work has been somewhat restricted on account of winter rains, but at the present time it is approximately 30 per cent complete, and will be ready to receive the surfacing early in the spring.

READY FOR SUMMER TRAFFIC

Plans are now under preparation to let a contract for placing bituminous treated surfacing on the graveled sub-base over the entire length of the project. It is planned that this contract will be completed during the early summer months, at which time it is expected the last of the five structures will have been finished and this large section of highway will be thrown open, completed, for the heavy summer traffic on the Redwood Highway.

The Commission has invested a large sum of money in this unit. As hereinbefore stated, the original grading contract cost approximately $672,000; the going contracts, at this time, of placing the graveled surface and the five structures, approximate an additional $440,000; making a total amount covered by contract in excess of $1,112,000. It is expected that the bituminous surfacing soon to be placed will raise the total cost of the project to a minimum of $1,225,000.

SAVINGS FOR MOTORISTS.

This is a great expenditure, but it could have been far greater and at the same time economically justifiable on the basis of the savings secured to the traveling public; for the new road is over three miles shorter than the old (18%); it follows the grade of the river, thereby obviating seven summits with a rise and fall of 3500 feet on the old road, together with curvature on very short radii to the extent of nearly thirty-three complete circles eliminated.

The new road is a wide, high standard highway, with long tangents connected by curves of large radius laid close to the river, and with right of way widened to include many of the natural beauty spots adjacent to the road.

Aside from the physical values now capitalized by the new construction, by no means the least of the satisfactions coming to the motorist will be the knowledge that one of the worst and almost the last of the great obstacles to complete enjoyment of a trip over the Redwood Highway is forever removed.

PUNCHEON FILLS ADD RUSTIC BEAUTY

(Continued from page 19)

have enhanced its value, as motorists and visitors will be afforded an opportunity to enjoy vistas of the forest in its primal state heretofore available to none but the few.

This highway, when completed late this year, will be noteworthy, not because of the cost or the quantities involved in its construction, but as the culmination of an ideal in park highway construction.

The most blasé motorist or casual visitor passing through this area can not but stop and ponder over the majestic beauty of the cathedral-like appearance of these centuries-old monarchs of the forest.

Traffic Count Tabulations for 1934

(Continued from page 22)

(All routes as compared to 1932
Count ——18.5% —1.5%)

Gain or loss in traffic volume for State Highway Routes 1 to 81, inclusive, expressed as a percentage of the January, 1933, count, is as given below. No comparison can be made for Routes 82 to 202 as 1933 figures are not available.

Route	Termini	1934 Per cent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito-Oregon Line		.66	7.61	
2.	Mexico Line-San Francisco		2.15	4.77	
3.	Sacramento-Oregon Line		2.03	17.24	
4.	Los Angeles-Sacramento	4.89		25.01	
5.	Santa Cruz-Jct. Rt. 65 near Mokelumne Hill		.83	1.94	
6.	Napa-Sacramento via Winters		2.42	.74	
7.	Benicia-Tehama Jct.		12.28	5.11	
8.	Ignacio-Cordelia via Napa		8.34	8.26	
9.	Jct. Rt. 2 near Montalvo-San Bernardino	24.17		58.71	
10.	Rt. 2 at San Lucas-Sequoia National Park	3.55		27.47	
11.	Jct. Rt. 75 near Antioch-Nev. State Line via Placerville		13.13	7.76	
12.	San Diego-El Centro	32.87		30.95	
13.	Jct. Rt. 4 at Salida-Jct. Rt. 23 at Sonora Jct.	11.05		17.98	
14.	Albany-Martinez		1.6	6.48	
15.	Rt. 1 near Calpella-Rt. 37 near Cisco		14.74	12.83	
16.	Hopland-Lakeport		10.55		2.42
17.	Jct. Rt. 3 at Roseville-Jct. Rt. 15, Nevada City	25.35		21.24	
18.	Jct. Rt. 4 at Merced--Jct. Rt. 40 near Sequoia		15.15		30.15
19.	Jct. Rt. 2 at Fullerton-Jct. Rt. 26 at Beaumont	24.47		58.02	
20.	Jct. Rt. 1 near Arcata-Jct. Rt. 83 at Park Bdy.	16.95		20.42	
21.	Jct. Rt. 3 near Richvale-Jct. Rt. 29 near Chilcoot, via Quincy	6.37		15.07	
22.	Jct. Rt. 56, Castroville-Jct. Rt. 29 via Hollister	50.95		14.93	
23.	Saugus-Rt. 11, Alpine Jct.	10.78		40.35	
24.	Jct. Rt. 4 near Lodi-Nevada State Line	3.14		16.45	
25.	Jct. Rt. 37 at Colfax-Jct. Rt. 83 near Sattley	12.19		39.11	
26.	Los Angeles-Mexico via San Bernardino		1.16	11.48	
27.	El Centro-Yuma	8.06		11.31	
28.	Redding-Nevada Line via Alturas		6.22	34.64	
29.	Peanut-Nevada Line near Purdy's		1.01	18.2	
31.	San Bernardino-Nevada State Line	4.37		43.92	
32.	Jct. Rt. 56 Watsonville-Rt. 4 near Califa	.28			2.04
33.	Rt. 56 near Cambria-Rt. 4 near Famosa			19.64	
34.	Jct. Rt. 4 at Galt-Rt. 23 at Picketts Jct.	22.92		40.02	
35.	Jct. Rt. 1 at Alton-Jct. Rt. 20 at Douglas City	19.18		16.95	
37.	Auburn-Truckee	13.68		10.55	
38.	Jct. Rt. 11 at Mays-Nevada Line via Truckee River	57.36		10.55	
39.	Jct. Rt. 38 at Tahoe City-Nevada State Line	49.66		16.97	
40.	Jct. Rt. 13 near Montezuma-Jct. Rt. 76 at Benton	10.29		29.00	
41.	Jct. Rt. 5 near Tracy-Kings River Canyon via Fresno		3.73		3.58
42.	Redwood Park-Los Gatos	2.93		.70	
43.	Jct. Rt. 60 at Newport Beach-Jct. Rt. 31 near Victorville	10.54		34.06	
44.	Boulder Creek - Redwood Park	28.54		42.42	
45.	Jct. Rt. 7 at Willows-Jct. Rt. 3 near Biggs		6.99	9.06	
46.	Rt. 1 near Klamath-Rt. 3 near Cray	5.26			5.59
47.	Jct. Rt. 7 at Orland-Jct. Rt. 29 near Morgan	17.80		19.28	
48.	Rt. 1 near McDonalds-Rt. 56 near Albion	5.39		6.11	
49.	Napa to Jct. Rt. 15 near Sweet Hollow Summit		21.85		1.65
50.	Sacramento-Jct. Rt. 15		19.63	3.75	
51.	Jct. Rt. 8 at Schellville-Sebastopol		1.85	3.24	
52.	Alto-Tiburon	23.77		30.78	
53.	Jct. Rt. 7 at Fairfield-Jct. Rt. 4 at Lodi via Rio Vista		3.84		3.92
54.	Jct. Rt. 11 at Perkins-Jct. Rt. 65 at Central House		16.01	11.06	
55.	Jct. Rt. 5 near Glenwood-San Francisco		29.77		15.43
56.	Jct. Rt. 2 at Las Cruces-Rt. 1 near Fernbridge	21.56			.31
57.	Rt. 2 near Santa Maria-Rt. 23 near Freeman via Bakersfield	11.88		35.06	
58.	Rt. 2 near Santa Margarita-Ariz. Line near Topoc via Mojave and Barstow	16.69		32.24	
59.	Jct. Rt. 4 at Baileys-Jct. Rt. 43 at Lake Arrowhead	25.13		38.34	
60.	Jct. Rt. 2 at Serra-Jct. Rt. 2 at El Rio	8.33		42.31	
61.	Jct. Rt. 4 S. of Glendale-Jct. Rt. 59 near Phelan		55.04	187.12	
63.	Big Pine-Nevada State Line	10.19		3.78	
64.	Jct. Rt. 2 at San Juan Capistrano-Blythe	25.49		20.84	
65.	Jct. Rt. 18 near Mariposa-Auburn	1.55		3.19	
66.	Jct. Rt. 5 near Mossdale-Jct. Rt. 13 near Oakdale	.25		.79	
67.	Pajaro River-Rt. 2 near San Benito River Bridge		10.90		12.61
68.	San Jose-San Francisco		.12	.04	
69.	Jct. Rt. 5 at Warm Springs-Jct. Rt. 2 San Rafael		9.39		10.01
70.	Ukiah-Talmadge		4.82	21.74	
71.	Crescent City-Oregon Line	25.30		.50	
72.	Weed-Oregon Line	.79		52.67	
73.	Rt. 29, near Janesville-Oregon Line	15.88		48.23	
74.	Carquinez Bridge - Napa Wye		18.89	12.91	
75.	Oakland-Jct. Rt. 65 at Altaville		2.59	11.58	
76.	Jct. Rt. 125 at Shaw Ave.-Nev. State Line near Benton	17.68		66.41	
77.	San Diego-Pomona	15.26		13.59	
78.	Jc. Rt. 12 near Descanso-Jct. Rt. 19 near March Field	25.58		22.69	
79.	Jct. Rt. 2 at Ventura-Jct. Rt. 4 at Castaic	10.45		49.36	
80.	Jct. Rt. 51 at Rincon Cr.-Rt. 2 near Zaca		2.29	11.51	
81.	Rt. 1 near Hiouchi Br.-Rt. 71 near Smith River		3.44	7.69	

Bridge Workers Find Bones of Mastodon 180 Feet Under Bay

ONCE upon a time, so long ago that we can not remember whether it was 25,000 or 1,000,000 years back, a huge, hairy, elephant-shaped mastodon lay down and died on the shores of the San Francisco Bay.

Many thousands of years passed and the Sacramento River went on carrying silt from way up by Kennett and deposited it on top of the mastodon's bones.

As the bay filled up with silt, it spread out over a larger area and finally the bones of this mastodon were covered by 130 feet of clay and 50 feet of water.

TOMB IN MID-BAY

The spot where the mastodon left all that was mortal of him was directly beneath Pier E-5 of the San Francisco-Oakland Bay Bridge, almost midway between Yerba Buena Island and the end of the Key Route Mole.

This mastodon bedtime story might have happened as narrated, or it might have been this way:

Perhaps the mastodon was roaming in the upper Sacramento Valley at an age when it was increasingly difficult for this huge creature to find enough to eat of the vegetation which had been rank and thick in growth but which was getting sparse.

Discouraged with life in the Pleistocene Age, the mastodon lay down and died and the Sacramento River washed his bones down into San Francisco Bay and deposited silt on top of him 150 feet deep.

HIGHLY POLISHED MOLARS

Something like this did take place. The proof of it is that last month engineers of the San Francisco-Oakland Bay Bridge Division of the State Department of Public Works pulled out of the bay-bottom 180 feet below water under Pier E-5, a 10-pound mastodon tooth.

The grinding surface of the molar was still as bright and highly polished as when the mastodon was roaming in what was then the dense vegetation on this coast, before the increasing coldness came.

The top of the tooth was approximately 8 inches long by about 4 inches wide and, while the root was broken off, the tooth still had a height of more than 8 inches.

"ALAS, POOR YORICK, or whatever your name was," says this Bay Bridge worker apostrophizing the tooth of a mastodon, perhaps the first prehistoric commuter who met his fate in the ooze of San Francisco Bay where his bones were unearthed under Pier E-5, 180 feet below the surface.

POSSIBLY FIRST COMMUTER

Professor R. W. Chaney, of the Department of Paleontology of the University of California, was given the tooth by Chief Engineer C. H. Purcell for examination, and it was Professor Chaney who supplied, not only the identification of the tooth as that of a mastodon, but narrated the probable beginnings of this early California settler.

Scientists say it is possible that this mastodon was the first commuter and that he drowned in the attempt.

Apparently this first commuter was followed by others because since discovery of his tooth the jawbone of some prehistoric bison has been unearthed under Pier E-4, 500 feet west of Pier E-5.

However this may be, the scientists and paleontologists will have to settle it by guess work for Chief Engineer Purcell, and Director of Public Works Earl Lee Kelly, and Governor James Rolph, Jr., head of the California Toll Bridge Authority, have all declared that the paleontologists will not be allowed to up-end this 180-foot bridge pier to hunt for other fossils in search for further history of this mastodon commuter.

1st Skinner: "Have you and your boss ever had any difference of opinion?"

2d Skinner: "Yes, but he doesn't know it!"

Highway Bids and Awards

FOR FEBRUARY

ALAMEDA COUNTY—A structure consisting of 22 reinforced concrete piers with timber piles, 10 reinforced concrete spans for the lower deck highway and interurban traffic and 6 reinforced concrete spans for the upper deck highway, located in Oakland immediately east of the East Bay Crossing of the San Francisco-Oakland Bay Bridge. District IV. McDonald-Kahn Company, Ltd., San Francisco, $269,692; Healy-Tibbitts Construction Co., San Francisco, $337,500; W. J. Tobin, Oakland, $346,010; Bridge Builders, Inc., Oakland, $358,000. Contract awarded to Clinton Construction Co., San Francisco, $253,665.

CALAVERAS COUNTY—Two bridges between 6 and 7 miles south of San Andreas, one across San Antonio Creek consisting of five 30-foot steel stringer spans on concrete pier and abutments, the other across San Domingo Creek consisting of five 30-foot steel stringer spans on concrete piers and abutments. District X, Route 65, Section B. Holdener Construction Co., Sacramento, $25,608; Nelson & Wallace, Escalon, $24,695; F. O. Bohnett, Campbell, $22,791; Baldwin & Butler, Berkeley, $23,273; M. B. McGowan, Inc., San Francisco, $23,427; Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, $23,124. Contract awarded to Poulos & McEwen, Sacramento, $22,511.

LOS ANGELES COUNTY—Between Williams Ranch and Summit, 15.4 miles grading and paving. District VII, Route 23, Section C,D. Gibbons & Read, Burbank, $179,799; Oswald Bros., L. A., $174,229. Contract awarded to Griffith Company, L. A., $168,587.25.

LOS ANGELES COUNTY—In the city of Los Angeles between Alameda Street and easterly boundary, 0.8 of a mile grading, and paving with asphalt concrete. District VII, Route 60, Section L.A. Griffith Company, Los Angeles, $66,672; Sully-Miller Contr. Co., Long Beach, $70,604. Contract awarded to Oswald Bros., Los Angeles, $63,923.50.

LOS ANGELES COUNTY—In city of Los Angeles between State Street and Mission Street 1 mile grading, paving with P. C. C. District VII, Route 26, Section L.A. Oswald Bros., Los Angeles, $193,540; Griffith Company, Los Angeles, $204,092; United Concrete Pipe Corp., Los Angeles, $211,657; M. J. Bevanda, Stockton, $212,875; Jahn & Bressi Const. Co., Los Angeles, $197,074; P. J. Akmadzich, $238,549; Southern Calif. Roads Co., $192,171. Contract awarded to C. O. Sparks & Mundo Engr. Co., Los Angeles, $181,791.

LOS ANGELES COUNTY—About 1 mile south of the city of Alhambra, 2 reinforced concrete girder bridges; Monterey Pass Road, 87-ft. span; and Coyote Pass Road, 65-ft. span and two 32½-ft. girders. District VII, Route 26, Section D. George Mittry, $108,612; Theo. A. Beyer Corp., L. A., $119,602; Byerts & Dunn, L. A., $99,572; H. Mayson, L. A., $104,877; Sharp & Fellows Contracting Co., L. A., $105,083; Herbert M. Baruch Corp., L. A., $97,756; Bannister-Field Co., Ltd., Fred E. Potts Co., L. A., $113,781; Andy Sordal, Long Beach, $104,732; R. H. Travers, L. A., $106,865; Jahn & Bressi Const. Co., L. A., $105,947. Contract awarded to Clinton Const. Co., L. A., $93,019.50.

LOS ANGELES COUNTY—Bridge in the city of Los Angeles across Ramona Boulevard at Cornwell Street consisting of 2 reinforced concrete steel spans about 50 feet long, 2 timber spans about 19 feet long and grading and surfacing roadway approaches with crushed rock and oil. District VII, Route 26. Herbert M. Baruch Corporation, Ltd., Los Angeles, $32,445; Byerts & Dunn, Los Angeles, $31,895; R. H. Travers, Los Angeles, $31,035; Jerome K. Doolan, Pasadena, $28,613; Andy Sordal, Long Beach, $28,647. Contract awarded to Joseph Maiser & David J. Reed, Los Angeles, $27,458.

MONTEREY COUNTY—Four timber bridges across Prewitt Creek, Wild Cattle, Mill, and Kirk Creeks. Between 32 and 36 miles north of San Simeon. District V, Route 56, Section B. Theo. M. Maino, San Luis Obispo, $66,805; M. B. McGowan, Inc., San Francisco, $67,797. Contract awarded to W. J. Tobin, Oakland, $66,171.30.

SAN DIEGO COUNTY—Between one mile north of San Ysidro and National City, about 7.3 miles to be paved with asphalt concrete. District XI, Route 2, Section F. Sander Pearson, Santa Monica, $208,361; Griffith Co., Los Angeles, $185,731. Contract awarded to V. R. Dennis Const. Co., San Diego, $168,044.

SAN DIEGO COUNTY—Two reinforced concrete girder bridges, one across San Marcos Creek consisting of four 40-foot spans, and one across Agua Hedionda Creek consisting of four 40-foot spans on concrete bents and abutments. District XI, Route 2, Section B. Frank Doran, San Diego, $74,306; Lynch-Cannon Engineering Co., Los Angeles, $69,167; Dimmitt & Taylor, Los Angeles, $79,928; Byerts & Dunn, Los Angeles, $76,152; Weymouth Crowell Co., Los Angeles, $68,475; R. H. Travers, Los Angeles, $75,624. Contract awarded to Bodenhamer Const. Co., Oakland, $67,505.

SAN MATEO COUNTY—Between Edgemar Rd. and Rt. 2, 2 miles grading, paving with asphalt concrete. District IV, Route Junipera Serra Boulevard. The Fay Improvement Co., S. F., $210,782; Union Paving Co., S. F., $197,926; Basich Bros., Torrance, $220,178; Chas. L. Harney, S. F., $244,527; Eaton & Smith, S. F., $219,997; Fredrickson Bros., S. F., $197,843; S. H. Palmer, S. F., $241,164; Peninsular Paving Co., S. F., $190,709. Contract awarded to D. McDonald, Jones & King, & R. O. Bohnett, Sacramento, $178,546.50.

SANTA BARBARA COUNTY—In Santa Barbara between Mission Street and Hollister Avenue, about 2.7 miles to be graded and paved with asphalt concrete on a Portland cement concrete base. District V, Route 2, Sections P,K. Sander Pearson, Santa Monica, $214,-375; United Concrete Pipe Corporation, Los Angeles, $199,390; Griffith Co., Los Angeles, $224,296; M. J. Bevanda, Stockton, $206,844. Contract awarded to J. E. Haddock, Pasadena, $198,426.

SANTA BARBARA COUNTY—Two bridges, one across Santa Ynez River consisting of eleven 65-foot reinforced concrete girder spans and two 25-foot cantilevers, the other across Santa Agueda Creek consisting of two 44-foot reinforced concrete girder spans and two 20-foot cantilevers on concrete bents. District V, Route 80, Section A. R. R. Bishop, Long Beach, $89,414; Bodenhamer Const. Co., Oakland, $98,332; Byerts & Dunn, Los Angeles, $94,313; H. Mayson, Los Angeles, $97,395; Herbert M. Baruch Corp., Ltd., Los Angeles, $95,402; Clinton Const. Co. of California, Los Angeles, $97,815; Andy Sordal, Long Beach, $109,121; Gist & Bell, Arcadia, $99,952; M. B. McGowan, Inc., San Francisco, $94,902; Theo. A. Beyer Corp., Los Angeles, $136,005; Sharp & Fellows Contracting Co., Los Angeles, $92,511; Dimmitt and Taylor, Los Angeles, $92,647; Lynch Cannon Engineering Co., Los Angeles, $104,712. Contract awarded to J. J. Munnemann Co., Santa Barbara, $84,411.

SOLANO COUNTY—At Cordelia, 0.63 of a mile grading and 2 concrete abutments for undergrade Xing. District X, Route 7, Section H. Biasotti, Willard & Biasotti, Stockton, $49,230; Granfield, Farrar & Carlin, and Sam Sciarrino, S. F., $43,440; J. R. Reeves & Lord & Bishop, Sacramento, $38,581; M. A. Jenkins & C. A. Baker, Sacramento, $40,560; A. H. Vogt Co., Inc., S. F., $47,355. Contract awarded to F. O. Bohnett, Campbell, $34,904.

VENTURA COUNTY—Between Ventura and Mussel Shoal, about 8.5 miles to be graded and paved with asphalt concrete. District VII, Route 2, Sections D,E,F. Sharp & Fellows Contracting Co., Los Angeles, $431,163; Griffith Co., Los Angeles, $448,640; Jahn & Bressi Construction Company, Inc., Los Angeles, $442,895. Contract awarded to Basich Brothers, Torrance, $430,172.

VENTURA COUNTY—Between westerly boundary of county and one-half mile east of West Casitas Pass, about 2.9 miles to be graded and treated with fuel oil. District VII, Route 151, Section B. von der Hellen & Pearson, Castaic, $110,818; Gist & Bell, Arcadia, $148,890; Daley Corp., San Diego, $144,284; Chas. L. Harney, San Francisco, $136,271; Yglesias Bros., San Diego, $129,436; Lang Transportation Co., Los Angeles, $122,866; Fredrickson & Watson Const. Co., and Fredrickson Bros., Oakland, $138,992; Macco Const. Co., Clearwater, $170,118; Sharp & Fellows Contracting Co., Los Angeles, $134,545. Contract awarded to C. W. Wood, Stockton, $105,530.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.----------Governor

EARL LEE KELLY----------Director

ERIC CULLENWARD----------Deputy Director

MORGAN KEATON----------Assistant Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
FRANK A. TETLEY, Riverside
DR. W. W. BARHAM, Yreka
C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary

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J. G. STANDLEY (Acting), Principal Assistant Engineer
R. H. WILSON (Acting), Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
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S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego
General Headquarters, Public Works Building, Eleventh and P Streets, Sacramento, California

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J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights
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H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
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HEADQUARTERS

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C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer

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HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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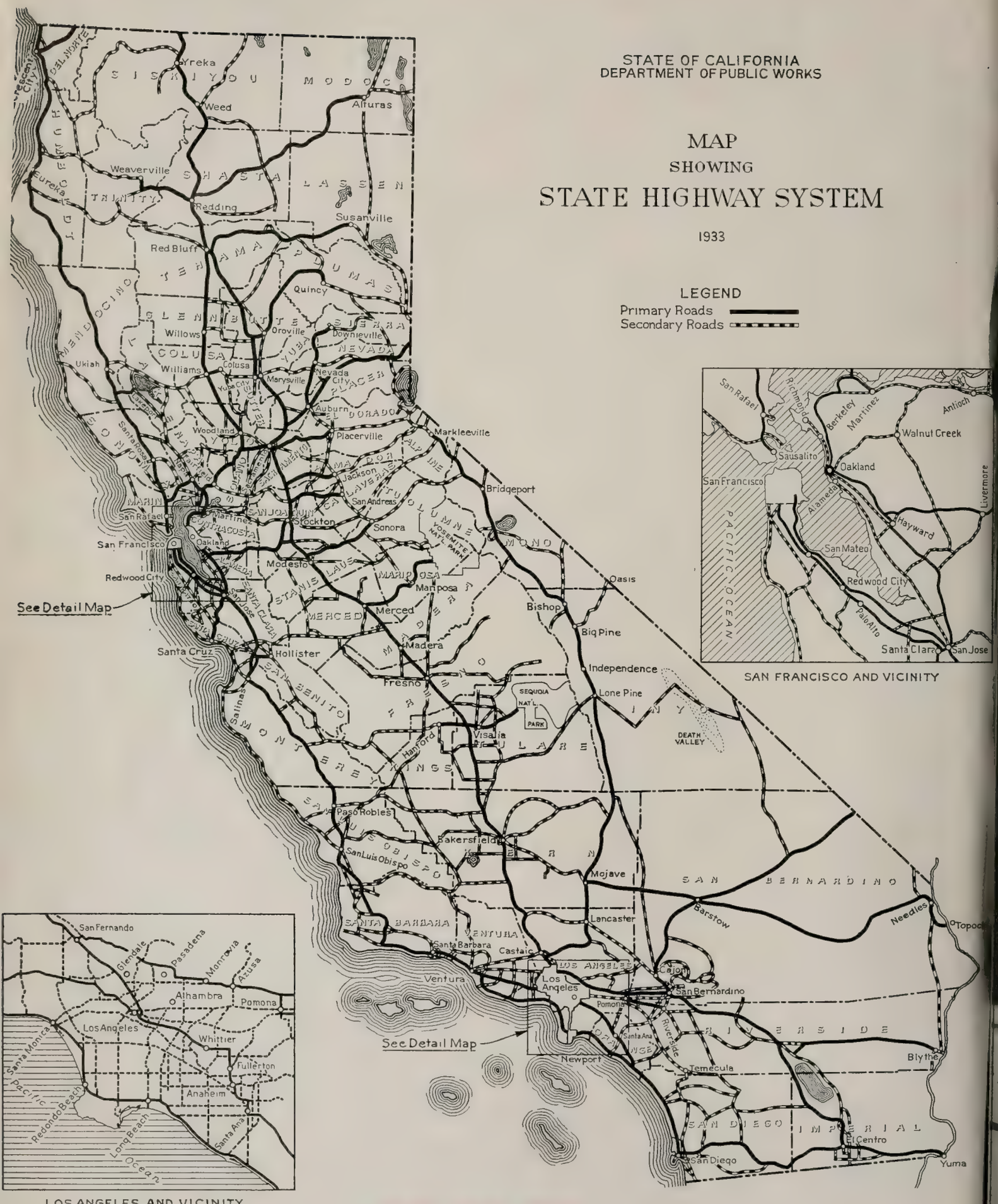
CALIFORNIA STATE PRINTING OFFICE
HARRY HAMMOND STATE PRINTER
SACRAMENTO, 1934

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM
1933

LEGEND
Primary Roads
Secondary Roads



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HIGHWAYS AND PUBLIC WORKS

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Official Journal of the Department of Public Works

APRIL 1934

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Highway Speed-up Program Shows 63% of Budget Projects Under Way

17,000 Men Employed, 1157 Miles of Road Built, in Eight Months of the Department's Construction Drive that Began August 25, 1933

By **EARL LEE KELLY**, Director of Public Works

THE current biennium, including the 85th and 86th fiscal years of State government in California, was ushered in July 1, 1933, in the midst of the great depression with a challenge to the Department of Public Works, under the urgent mandate of Governor James Rolph, Jr., to advance its construction program with the greatest possible speed in order that work might be furnished to thousands of citizens through this phase of public work.

That this department accepted the challenge and is successfully meeting and conquering the emergency is evidenced by the following facts:

On March 31st, with only 37.5 per cent of the biennium passed, over 63 per cent of the $34,000,000 construction budget had been placed under way; the projects included in this figure cover the building of more than 1157 miles of highway and the maintenance of the entire State system, at a cost of more than $27,000,000; only $2,416,700 of the $15,607,400 of Federal recovery funds allocated to California remain unobligated; maintenance work in all parts of the State has been completed and authorized totaling nearly $6,000,000. And this vast amount of construction is providing continuous work for an average of 8000 to 9000 men, with an estimated total of about 17,000 individuals who will have been given employment by the work inaugurated during these first nine months of the biennium.

EARL LEE KELLY

To gain a proper perspective of this accomplishment requires a brief statement of varied factors which had important bearing upon State highway work in California.

By act of the 1933 Legislature the mileage of the State highway system was increased from 7350 miles to 14,150 miles by the transfer of 6800 miles of county roads to the State system. The Legislature also provided for an allocation to incorporated cities of one-quarter cent of the State's share of gasoline taxes. On June 16th the President signed the National Industrial Recovery Act providing approximately $400,000,000 for State highway construction throughout the Nation; of this amount $15,607,000 was apportioned to California.

These changes in the highway financial situation made necessary a revision of the budget by the California Highway Commission. With

(Continued on page 10)

Sausalito Realignment Cost $246,000, Saves 460,000 Vehicle Miles Annually

In its 1.55 miles of length the old highway from Waldo Point into Sausalito, carrying Redwood Highway traffic averaging 5000 vehicles a day, had 22 sharp curves equaling 2½ complete circle turns. The new highway just completed, with only 6 long curves and one-quarter mile shorter, will save 460,000 vehicle miles, or 46,000 hours of vehicle time, per year, which means many dollars annually to motorists.

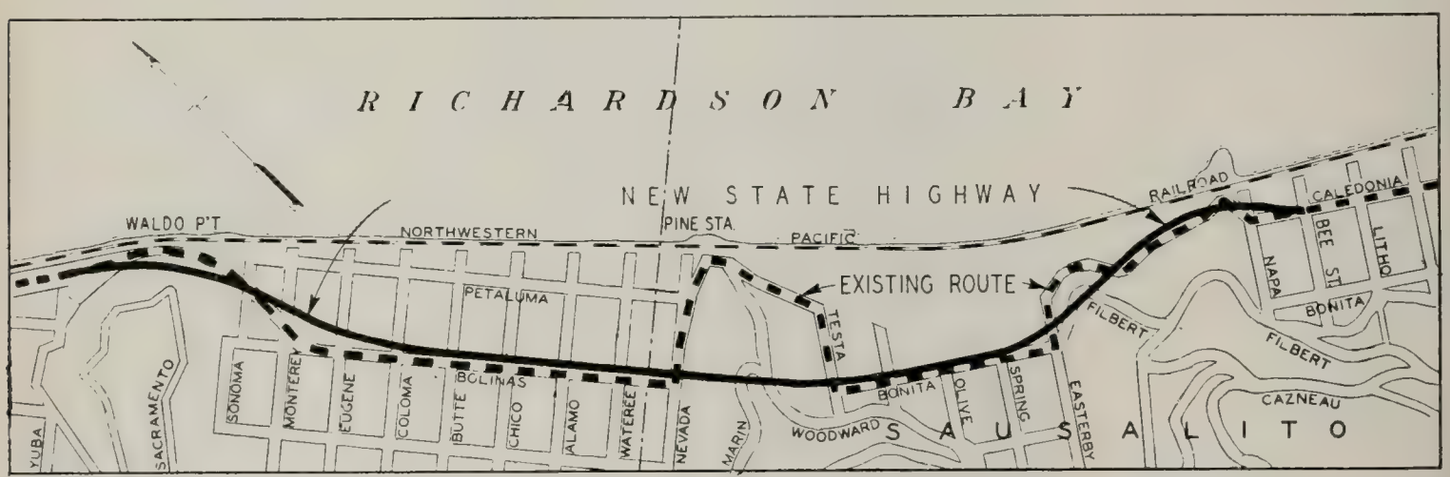
By **JNO. H. SKEGGS,** District Engineer

THE former highway route in Sausalito from the automobile ferries to the northerly city boundary is now a memory, somewhat comparable to a horizontal pinwheel for the motorist because there were so many sharp radius corners and curves that the total curvature was usually referred to in terms of complete circles instead of the number of degrees. This reference emphasizes the poor quality of alignment that previously existed over narrow, winding city streets as compared with the new broad highway on high standard alignment which has just been completed by the Division of Highways.

Since January, 1932, the State has been very active in a terminal construction for the Redwood Highway from Waldo Street to Water Street in Sausalito. The total work involved two contracts. The first contract began at Waldo Point immediately north of the north boundary of Sausalito and terminated at Napa Street within the city boundary of Sausalito, a total length of approximately 1.3 miles. This first project covered very heavy construction in straightening out the alignment necessary to provide an adequate highway. Heavy cuts in the side hills at Waldo Point and the ridge at Pine Station in Sausalito were made to obtain the necessary quantity of excavation to construct a heavy embankment across tidal flats in a cove between Waldo Point and Pine Station.

MANY BUILDINGS MOVED

Many buildings, including houses, warehouses, stores, railroad spurs and freight depot were removed from the additional rights of way obtained. Also short sections of local streets were rerouted and reconstructed entirely in order to provide a new right of way necessary on entering the closely built up hilly section of Sausalito in a manner that would be a credit to State highway construction and at the same time provide ample facilities for handling the heavy traffic to and from the automobile ferries between Sausalito and San Francisco.



Little can be said that would do justice to the work completed in eliminating the circuitous routing of the former highway around the railroad yards of the Northwestern Pacific and around the point at Pine Station and Waldo Point. The completion of this first unit was so favorably received by the general public as to be reflected in the demands of numerous civic organizations and leaders in

(Continued on page 22)

THE SAUSALITO BOTTLENECK terminal of the Redwood highway is just a bad memory. Four-lane modern roadways have replaced narrow winding streets. No. 1—New construction across tidal flats of Richardson Bay near Waldo Point. No. 2—Typical improvement on Bolinas Street. Inset shows former condition. No. 3—Reconstruction at junction of Bonita and Filbert streets. All buildings on left side of road were removed and highway was cut through hills.

State Grading and Oiling 40 Miles of Road on North Shore of Salton Sea

By **W. BEUTHEL,** Assistant Highway Engineering Draftsman

NOT many people, other than residents of the below-sea level empire that surrounds the Salton Sea, have traveled that most interesting route known as the "North Shore Road."

Those having occasion to drive along the 30-mile stretch of water which occupies the lowest portion of this former desert usually choose the high standard State highway on the other side in preference to the shorter but slower trail through the sand from Niland to Mecca which has but recently become a State secondary highway.

In addition to the difficulty of passing cars on the narrow and sandy roadbed, the North Shore Route had stretches of mud to trap the motorist who attempted it too soon after the occasional desert cloudbursts.

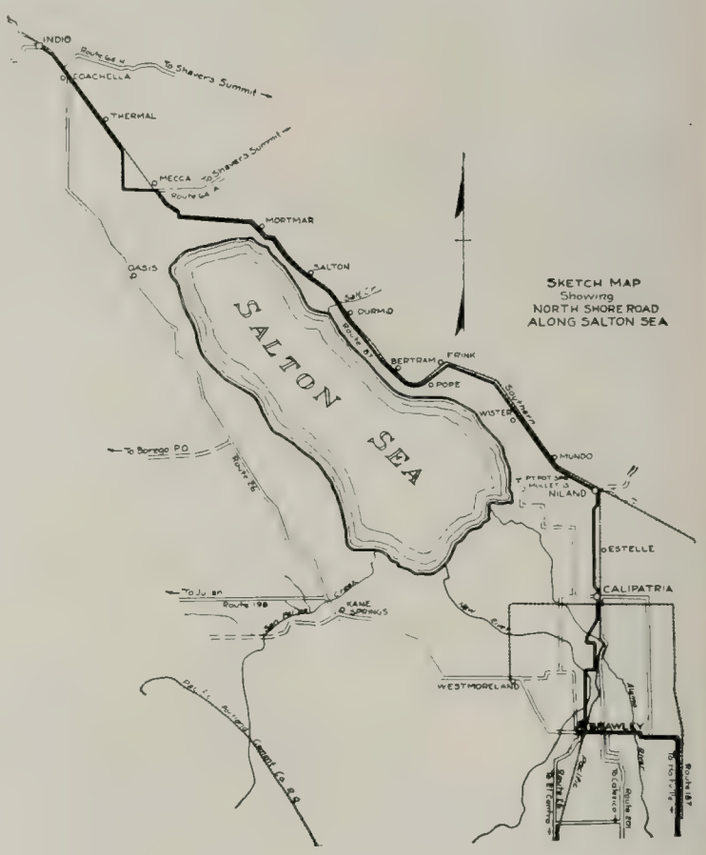
CLOSE TO THE SEA

It will gratify those who recall the interesting and romantic history of the Salton Sea to learn that this road is now being improved so that a safe and comfortable trip can be made by the ordinary driver practically any day in the year. The route passes very close to the Salton Sea and most of the interesting features, such as the gun clubs, resorts, speedboat course and industries, are along the north shore.

This body of salt water, lying some 250 feet below sea level and having a present area of about 200 square miles and a maximum depth of 50 feet, is of quite recent origin, although the entire valley was at one time a portion of the sea bottom. A very definite ancient beach line is easily traceable at the base of the mountains and minute shells form a considerable portion of the soil in some localities.

The irrigation of Imperial Valley by means of the Colorado River was considered practicable by certain early pioneers of the "49 days." The fact that the soil was a thick layer of silt, that the winter climate was mild and the summer extremely hot, left but one requirement for the early maturing of a variety of crops—a supply of water.

It was known that the river fairly close at hand and flowing at a much higher elevation



would furnish an ample supply, if it could be distributed by means of existing channels and a system of ditches. However, many years of delay resulted before sufficient engineering and financial support was accumulated, and actual irrigation of the land was not accomplished until 1901.

COLORADO FLOODED VALLEY

Almost at once a fair-sized boom resulted and several towns began a rapid growth. The very early crops proved a most valuable advertisement of the valley's possibilities. Then in 1905 and 1906 came the extraordinary flow of water in the river which finally broke through the irrigation structures and for many weeks poured practically the entire flood down the valley into the ancient lake bed. The sea rose seven inches a day and reached an area of 400 square miles.

The Southern Pacific Railroad, whose main line crossed the ancient sink, was forced to move five times to higher ground. Evidence of the original location is the line of telegraph poles still standing several hundred feet

(Continued on page 19)

SALTON SEA with its vast expanse of blue, wave-capped waters, speedboat courses and fisheries resembles an arm of the sea which it once was. Teams and hand labor are building a forty-mile road along the north shore where only a sand rut trail exists.

Pacheco Pass Project Will Abolish 34 Curves, Widen Road, Reduce Grades

By **R. E. PIERCE,** District Engineer

OF the several State highways which cross the Coast Range between the Great Central Valley and the coast, the second in importance from a traffic standpoint is the so-called Pacheco Pass Road (Route 32). It extends from Gilroy on Primary Route 2, the Coast Route south of San Francisco, to Califa, in Madera County, on Route 4, the primary highway through the San Joaquin Valley known as the Golden State Highway.

This road is especially noteworthy for the large amount of truck traffic it carries due to the fact that it connects the great San Joaquin Valley and its extensive agricultural resources with the populous Santa Clara Valley and the Monterey-Santa Cruz coastal area.

NARROW ROAD, SHARP CURVES

Owing to the quantity and type of traffic, the low standard alignment, curvature and surfacing on the existing road over the mountains, built some twelve years ago, are a serious handicap to travel.

This project, for which bids were opened on March 21, consists of grading and surfacing on a new alignment following closely the present road and extending from the summit of Pacheco Pass, elevation 1375 feet, easterly for 3.3 miles to the foot of the grade, elevation 407 feet.

The present road, between the above limits, has a roadbed 21 to 24 feet wide, with an indifferent, oil-gravel surface 18 feet wide, and a total of 48 curves, 44 of which have radii of 500 feet or less, one having only a 90-foot radius. These curves have a total angle of 1901 degrees, which means that all travel negotiating this 3.3 miles of road must make over five complete circles. There is 8300 feet of 7 per cent grade on this old location.

THIRTY-FOUR CURVES ELIMINATED

The new alignment contains ten curves, the sharpest having a radius of 570 feet, the balance having radii of 800 feet and over. The total angle of these curves is 411 degrees or slightly over one complete circle. The maximum grade is 6 per cent and the new roadbed will be 30 feet wide.

The grading due to the abrupt character of the terrain will be heavy. Some of the cuts are as deep as 80 feet, and one fill is over 100 feet high. The total estimated excavation is 306,000 cubic yards.

It is planned to make the surfacing 22 feet wide with a 5-inch compacted base of untreated crushed gravel and a 3-inch compacted bituminous crushed gravel surface.

ANCIENT SPANISH GRANT

One rather unusual feature is that the ownership of property along this change and for several miles on either side is under one proprietorship, the original Spanish grant, known as Rancho San Luis Gonzago, having been largely held intact, and this section still belongs to the Pacheco heirs, the family from which the pass takes its name.

A few miles to the east of this project, and on the highway, is the old San Luis adobe ranch house, which, as stated on a tablet placed there in 1931 by the Yosemite Parlor No. 24 N. S. G. W., Merced, was then at least 105 years old.

The original walls, about three feet thick, are in an excellent state of preservation and some of the original hand-hewn timbers are still in place inside.

OLD STAGE STATION

The location of this building on the banks of Cottonwood Creek was undoubtedly due to its never-failing supply of water in the creek, which is a branch of San Luis Creek. For a number of years the road over the Pacheco Pass was a toll road and this building was used as a stage station.

The building is now being operated as a restaurant, and fortunately the people running it seem anxious to preserve the building in its original condition. They have quite a collection of interesting relics found in the vicinity.

This improvement, which rebuilds the east approach to Pacheco Pass, should prove of great benefit to the traffic using it, which amounts at peak periods to nearly 2000 vehicles a day.

SOME 48 CURVES, mostly sharp ones, as shown in the top picture, distinguish the 3.3 miles of Pacheco Pass road from the summit easterly to the foot of the grade. New alignment indicated by dotted lines in the lower views will eliminate all short radius turns, widen the roadway and lessen grades. The historic San Luis adobe ranch house, 105 years old is shown at bottom.

Morgan Keaton Made Deputy Director Succeeding Eric Cullenward, Resigned

MORGAN KEATON, Assistant Deputy Director of Public Works, a former Assemblyman from southern California and a former State Adjutant of the American Legion, was appointed Deputy Director of Public Works by Governor Rolph on March 27, 1934, to fill a vacancy created by the resignation of Eric Cullenward.

Mr. Keaton for a number of years was engaged in the real estate and insurance business in Long Beach and Los Angeles where he took a prominent part in the civic affairs of these communities. He was elected a member of the Assembly from the Seventieth District in 1926 and served in the Forty-seventh and Forty-eighth Legislatures, being reelected in 1928.

OFFICER IN WORLD WAR

Born in Virginia, Mr. Keaton attended Roanoke College and then went to Washington and Lee University for a four-year prelegal course, majoring in political science and political economy.

In 1916 he enlisted in the First Minnesota Infantry for service on the Mexican border and in 1917 he entered the first officers' training camp at Fort Snelling, Minn., where he was commissioned a second lieutenant in infantry.

He was assigned to the Eighty-eighth Division and served in France during the World War, being discharged with the rank of captain in the infantry.

Soon after returning to America he came to California and in 1920 established a residence in Sacramento, where he engaged in the general real estate business.

WAS LEGION EXECUTIVE

He was appointed Adjutant of the American Legion, Department of California, in 1921 and served three terms in that office, from 1921 to 1924, with headquarters in San Francisco.

Since November 9, 1932, Mr. Keaton has served as Assistant Deputy Director of Public Works, where he has become thoroughly familiar with the work of the Public Works Department and its various divisions. Following the 1933 session of the Legislature,

MORGAN KEATON

which passed the Outdoor Advertising Act administered by the Department of Public Works, he was appointed chief enforcement officer of this department, where he set in motion all the forms and regulations in connection with the enforcement of the act.

HANDLED UNEMPLOYMENT RELIEF

For the past two winter seasons, Mr. Keaton has also handled the unemployment relief program of the Division of Highways, together with his other duties.

In connection with Mr. Keaton's new office, he will still supervise the work of the outdoor advertising department and the unemployment relief work as carried on by his former assistants. James Call, who is outdoor advertising assistant, will handle the bulk of the work in that department, and Roger Millard, who is unemployment relief assistant, will handle that branch of the work.

"But I don't know what to do," said the wife, learning to drive.

"Just imagine that I'm driving," replied her spouse.

Editorial Sanctum Lured Cullenward From State Office

ERIC CULLENWARD, former Deputy Director of Public Works, resigned that office March 19 to "return to his first love," the newspaper profession, as news editor of the *San Francisco Chronicle.*

Mr. Cullenward had made a brilliant record in his short career in public life and his outstanding ability and talents had won him a host of friends in all parts of the State as well as in official circles, but when the attractive offer of an important editorial position on a large metropolitan daily came to him "out of a clear sky" he found the lure of the "newspaper game" irresistible.

He began his rapid climb to a high post in the State service as secretary of the Highway Commission by appointment of Governor Rolph in June, 1931. Here he gained an intimate knowledge of the work of the Division of Highways and Department of Public Works that proved a valuable asset. He was drafted from this position by Governor Rolph to organize the Bureau of Publications and Documents created by the 1931 Legislature.

When Earl Lee Kelly became Director of Public Works Eric Cullenward was chosen for the deputy directorship and appointed to that office on November 9, 1932, thus having won appointments to three important State offices in seventeen months.

Mr. Cullenward had a long and successful career as a newspaper man before coming into public life. Starting as a young reporter in San Francisco, he rose through all the grades of that exacting profession to the rank of managing editor of the *San Francisco Examiner.*

Transferred to the *Los Angeles Examiner* as day managing editor he remained with that paper throughout the rest of his newspaper career in Los Angeles until his entrance into official life in Sacramento.

His leavetaking was marked by a flattering display of the esteem in which he is held both by fellow workers of the Department of Public Works and the Capitol newspaper contingent.

The Bore—Well, fellows, there I was on that lonely road, miles from nowhere, with a blazing car, no water, no fire extinguisher or anything. What do you imagine I did?

One of the Bored—Took a deep breath and blew the fire out.

ERIC CULLENWARD

Bulletin Discusses Costs of Irrigation

The release is announced by Edward Hyatt, State Engineer, of Bulletin No. 43 of the Division of Water Resources entitled "Value and Cost of Water for Irrigation in Coastal Plain of Southern California." This is one of the bulletins reporting on the various features of South Coastal Basin Investigation being conducted under the supervision of Harold Conkling, Deputy State Engineer.

The bulletin was prepared by Frank Adams and Martin Huberty, Professor and Associate Professor of Irrigation Investigations and Practice in the University of California. Its preparation was through a cooperative agreement between the University and the State Department of Public Works.

The bulletin is the result of an effort to find what the farmer can pay for water for the principal crops of southern California, *i.e.*, citrus and deciduous fruits, walnuts, beets, beans and alfalfa. Many records were consulted and are included in the bulletin. While it is not possible to reach a final and definite conclusion for an industry such as citrus growing with even more variable factors than ordinary agriculture, yet certain broad limits are observable from the data and the discussions and analyses and it will prove a valuable guide in the complex economics of agriculture in southern California.

Work Under Way Totals $27,739,000

(Continued from page 1)

the adoption of this revised budget, the work of getting projects under way at the earliest possible moment was begun.

Due to the necessity of waiting for the effective date of August 22d, when the new State Contract Law, the California Recovery Act and other acts passed by the last Legislature went into effect, the first real salvo of the attack against the depression was not fired until August 25th. On this date bids were called for fifty contracts on highway construction throughout the State.

The entire staff of the Division labored night and day to put the budgeted work under way as rapidly as possible. Additional engineers and draftsmen were put to work, several of the offices working on double shifts to prepare plans and specifications for this mammoth construction drive.

The program was put under way at top speed and has so continued with the exception of construction delays caused by necessary suspension of work in the mountain areas during the winter months and the necessity of a cessation of advertising for contracts in northern California during part of January and most of February due to a restraining order served on the Department of Public Works in connection with the code of the excavating and dump truck contractors. However, the delay caused by the restraining order was only temporary as the court upheld the judgment of the attorneys for this department and full speed ahead is again the order of the day.

U. S. BUREAU COOPERATED

This commendable achievement of the last nine months in putting approximately $27,000,000 of road construction under way speaks for the wholehearted spirit of cooperation which has obtained not only within the Division of Highways engineering staff, but in their necessary contacts with the engineering staff of the United States Bureau of Public Works and officials of the National Recovery Administration, whose approval is required on all projects financed with the aid of Federal funds.

In setting in motion this highway program, 228 contracts were awarded between August 25, 1933, and March 31, 1934, totaling $19,089,300. Of these, 188 were road construction contracts and 40 for bridges and grade separations. Day labor, minor improvements and maintenance work accounted for $7,164,500 and prison camp road construction for $1,485,700, making a grand total of $27,739,300.

Of the total, 143 were financed with the aid of the National Recovery funds, amounting to $12,293,600.

FEDERAL CONTRIBUTIONS

The importance of the contribution of Federal funds to California's greatest highway construction program can scarcely be overestimated.

The National Industrial Recovery Act provided for the use of funds apportioned to the States on specific classifications of roads, the set-up being that 50 per cent of the amount apportioned was to be expended upon the existing Federal Aid Road System within the State, not less than 25 per cent for improvement to the routes of this system through incorporated municipalities and a maximum of 25 per cent for the improvement of secondary feeder roads off the Federal aid system. California's progress in getting work under way by March 31st on these three classifications is shown below:

	Apportionment	Contracts awarded
Federal Aid System	$7,803,700	$7,531,500
Municipalities	3,901,800	2,559,300
Secondary Roads	3,901,800	2,359,500
Total Awarded		$12,450,300
Projects Advertised		740,300
Totals	$15,607,300	$13,190,600

The Federal funds which were appropriated for apportionment to the States under the authority of the National Industrial Recovery Act carry certain restrictions which insure that a maximum of money expended on construction would go to labor as directly as possible. These restrictions require that labor be limited to thirty hours in any one calendar week and that many types of construction operations be limited to hand labor methods so that the labor required to complete each individual project will require a maximum of man power.

Another restriction which has greatly affected the labor employed on this type of

Working Hours Cut by State but Pay Remains the Same

(Continued from preceding page)

public work is the requirement that all labor shall be selected from lists of available men in the county or political subdivision in which the work is situated; such lists to be furnished by local Federal employment agencies. This provision has insured the spread of wages for highway construction among citizens of the community in which the improvement is made.

STATE REDUCED HOURS

Similar provisions have been included in the specifications for projects which are financed solely by State funds so that identical conditions favoring the relief of unemployment obtain on all contracts for State highway construction.

To further this relief of unemployment the working hours of State highway maintenance forces have been reduced from 48 hours to 40 hours a week with no corresponding reduction in pay. This move increased normal maintenance forces from about 2000 to 2200 men. In addition to this increase, provisions were made for direct unemployment relief by the expansion of regular maintenance crews from October to June, providing half-time work for approximately 4000 men.

It is estimated that the peak of employment of the present construction drive will be reached early this summer with approximately 17,000 men at work on the California State Highway System.

PROUD OF AIDES

On March 31st there were 160 going contracts in force with the Department of Public Works, consisting of 109 road projects and 51 bridges.

The Department of Public Works has done its share in this great battle against depression to give relief to worthy, needy men of family out of work.

I am proud of the fine group of engineers and employees of this great far flung department extending as it does into every corner of every county of California, for it has been through their unselfish work, cooperation and assistance that the greatest construction drive in the history of California has been made possible.

Model of Appian Way Shows Romans Were Extravagant Builders

A DAY on the Appian Way, the most famous road of ancient Rome, is visualized in a large model of the Roman road exhibited at the recent convention of the American Road Builders' Association at Chicago. This model shows both the construction of the road and the traffic on the highway. It was prepared by the Bureau of Public Roads, U. S. Department of Agriculture, after investigation as to the design of this most famous highway in history, typical methods of construction, and the various types of traffic served. The model will be located permanently in the National Museum in Washington.

An article in the *Southwest Builder and Contractor* in describing the road says such roads would be regarded today as wasteful because they would cost six times as much as the wide modern highways.

This road, which endures after twenty centuries, was 16 feet wide with 2-foot curbs 18 inches high on both sides beyond which were 8-foot side roads. The Appian Way was of solid stone and concrete masonry 3 to 4½ feet thick, depending upon the soil on which it was laid. It was very straight, with steep grades and the curves widened as on modern roads.

In building the Appian Way, a bed of sand and gravel, sometimes covered with a thin coat of lime mortar, was used as a foundation for the four layers of masonry. The first masonry layer, from 10 inches to 2 feet thick, was composed of stones that would fit in a man's hand, held together with lime mortar or clay. The second layer of smaller stones mixed with lime mortar was 9 inches thick. The third layer was of concrete made of small stones, sand and hot lime mortar 1½ feet thick in the center and a foot thick on the sides to give crown to the road. The fourth or wearing layer was of polygonal stones about 3 feet in diameter and 6 inches thick laid with close joints. The upper surface of the wearing stones was dressed smooth and the joints fitted so tight as to be scarcely discernible.

The chief difference between the ancient Roman road and the modern highway is that the present-day engineer relies upon the soil to bear the load; the pavement should act as a wearing surface and a roof to protect the supporting subgrade soil. The Romans relied solely on massive construction.

Victory Highway Realignment Cuts Out 42 Curves and Reduces Distance

By **C. H. WHITMORE,** District Engineer

ANOTHER step toward the realization of the desire for a high-speed, shorter and more direct route to the east over the all-year road via Donner Summit will soon be accomplished by the completion of the project in Placer County, between Loomis and Newcastle, now under construction.

Previous construction on this route has eliminated considerable poor alignment and grades with the result that the distance in miles and driving time has been shortened between Newcastle and Auburn. The present construction is continuous and southerly to the previous construction.

The project lies in the foothills of the Sierra Nevada Mountains and practically the entire length is through beautiful and valuable orchard lands. From these orchards some of the earliest shipments of fruit are made from California to the eastern cities.

PRESENTS MAJOR PROBLEM

Because of the alignment going through these various orchards, replacement of irrigation facilities was a major problem, necessitating several siphons and special drainage features.

The existing State highway was constructed in 1917 and is approximately parallel to the Southern Pacific Railroad from Roseville to Penryn.

This contract is 5.2 miles in length, or a saving of .7 of a mile over the old alignment of 5.9 miles. The old alignment consists of 51 curves having a minimum radius of 150 feet, a maximum radius of 5000 feet, through angles totaling 1305°, and uses a maximum 7 per cent grade with total adverse grade of 231 feet.

The new alignment consists of long tangents with only nine curves, having a minimum radius of 2600 feet and a maximum radius of 5000 feet through angles totaling 154° and uses 6 per cent maximum grade with a total adverse grade of 30 feet.

SKETCH MAP of route between Loomis and Newcastle on State Highway No. 17, the Victory Highway. The new road now under construction is shown by the heavy black line.

LOOMIS TO NEWCASTLE

The beginning of this project is at the westerly limits of the town of Loomis and extends easterly to about one-half a mile west of the recently constructed Newcastle tunnel.

It is estimated that the construction will cost approximately $260,500 and will be expended through the major construction items of 160,000 cubic yards excavation, 3850 cubic yards Portland cement concrete pavement, 17,000 tons asphaltic concrete pavement, and the necessary drainage structures, etc., incidental to the completion of a finished roadway.

The January traffic census indicates an average daily traffic of 2100 vehicles.

(Continued on page 22)

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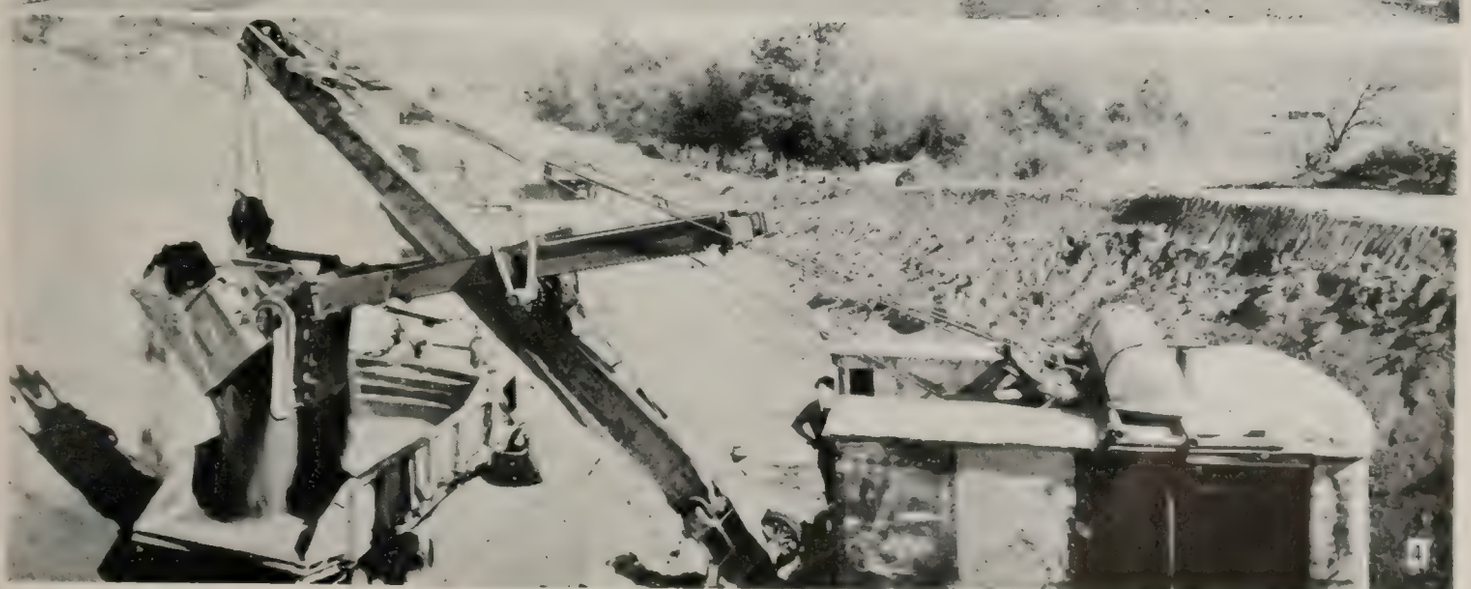
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ANOTHER STEP in the improvement of U. S. 40, the Victory Highway, is the realignment under way between Loomis and Newcastle on the unit of this State highway, between Sacramento and Donner Summit.

No. 1—Rough grading on new subgrade between Loomis and Penryn. No. 2—Present highway showing old concrete and two of the numerous sharp radius curves that will be eliminated. No. 3—View of completed improvement between Newcastle and Auburn. No. 4—Cutting and filling operations with shovels and trucks at work on a sizeable dirt moving job.

Commission Asks Congress to Grant $400,000,000 Additional Highway Funds

CALIFORNIA has acted promptly to secure its share of an additional Federal grant of $400,000,000 if Congress passes one of the several bills recently introduced to secure the appropriation of that amount to continue necessary highway construction in the State and further contribute to unemployment relief.

Under orders of Governor Rolph and upon the recommendation of Director Earl Lee Kelly of the Department of Public Works, Harry A. Hopkins, Chairman of the California Highway Commission, left for Washington, D. C., April 9th, bearing a resolution of the California Highway Commission urging Congress to make the grant of which California's share will approximate $16,000,000. He will act with highway officials of other States and California congressional representatives in support of the appropriation.

Chairman Hopkins recently attended the conference of the Western Association of State Highway Officials, held March 13th in Salt Lake City, where a resolution was passed urging Congress to make the additional grant.

310,000 JOBS INVOLVED

That resolution stated that 79 per cent of the funds previously allocated to the eleven Western States is under contract and present plans call for the completion of all projects not later than November 1st, when thousands of men will be thrown out of work that private industry will not be able to absorb. This number is placed at 135,000 individuals in the eleven Western States on part-time highway work and 175,000 indirectly employed.

The resolution further states that Federal taxes levied directly upon road users and indirectly through the sales tax during 1933 more than equaled last year's $400,000,000 appropriation and a further similar appropriation will merely return to the road user his taxes. The major portion of United States public lands lies in the eleven Western States from which those States receive no taxes.

This resolution of the Western Association of State Highway Officials was brought to the attention of the California Highway Commission at its last meeting on April 6th by Chairman Hopkins, together with Bill H. R. 8781, recently introduced in Congress covering the request made by the conference resolution.

COMMISSION ASKS GRANT

The Commission thereupon passed a resolution urging the appropriation of a sum not less than $400,000,000, stating that by June 1st all of California's share of the previous $400,000,000 grant will be under contract and the ensuing curtailment of highway construction will mean the unemployment of thousands of men with dependents.

The resolution, of which a copy was sent to each member of California's congressional delegation, reads as follows:

WHEREAS, There has been brought to the attention of the California Highway Commission in session this sixth day of April, 1934, a bill introduced in the House of Representatives of the United States Congress designated as H. R. 8781, covering an appropriation to provide for emergency construction of public highways and related projects and for other purposes in a sum of not less than $400,000,000 to be expended by the highway departments of the several States under the provisions of Section 204 of the National Industrial Recovery Act approved June 13, 1933; and

WHEREAS, This Commission, being familiar with the program of construction and relief to the unemployed as provided in the original grant under this emergency measure, realizes the superior effectiveness and does approve of this method of relief not only to unskilled labor but also to skilled labor and indirectly to the so-called "white collar employee"; and

WHEREAS, California's portion of the original grant is 79 per cent under contract and by the first of June all of the appropriation will have been placed under contract; and

WHEREAS, The State of California has not decreased its revenue for highway construction and as far as activities within the control of the California Highway Commission this program will continue; however, the major part of such State funds are necessary to maintain and preserve the large investment already made; and

WHEREAS, A large portion of the highways of the State have not been improved to standards adequate to give a reasonable service and protection to the public as well as the necessity exists of eliminating many thousands of railroad and highway grade crossings; and

Resolution Points to Impending Lack of Work This Summer

(Continued from preceding page)

WHEREAS, The curtailment of highway construction beyond the undertakings possible with State funds will mean the unemployment of thousands of men and the deprivation of the necessities of life to themselves and dependents; and

WHEREAS, It does not appear likely at this time that other industries will be able to absorb this class of employment; and

WHEREAS, Highway construction and allied industries in California, which is also true of the eleven Western States and from all reports is equally true of all States, has demonstrated its suitability as a type of public works to provide the maximum of widespread employment as well as an investment which can be realized upon in the future; and

WHEREAS, California's allocation under the original grant will have provided a total of approximately 10,000,000 man hours exclusive of relief provided to allied industries which will suffer along with highway construction by a reduction in such activities; and

WHEREAS, The major portion of the United States public lands lie in the eleven Western States from which those States receive no revenue from taxation; now, therefore, be it

RESOLVED, By the California Highway Commission, that commendation be made to the U. S. Bureau of Public Roads for its successful handling of the present NIRA program; and be it further

RESOLVED, That the California Highway Commission respectfully requests and urges the Congress of the United States to authorize at the earliest possible date additional funds for the fiscal year 1935 in an amount of not less than $400,000,000 with such other appropriations for national forest highways, national park roads, Indian reservation roads, etc., by the adoption of a bill containing the provisions of H. R. 8781.

INJURIES TO CHILDREN FROM BLASTING CAPS INCREASED

The year 1933 showed a slight increase in the number of injuries to children from playing with blasting caps. As a result the Institute of Makers of Explosives issues an appeal for prevention, saying:

"As you know, blasting caps are sometimes left by careless workmen following road work, contracting operations, and in and around mines and quarries.

"Sometimes a cap will explode when carried in the pocket and bumped. Other times children throw them in bonfires, strike them with a hammer or rock, ignite by matches, or pick them with pins or sharp instruments. Stamping caps with the feet or "shooting" them against a wall with a sling shot are among the many ways caps are detonated, with disastrous results.

Because of these accidents, many children are now facing the future blind and maimed. Fingers and even hands have been blown off, and many faces and bodies have been severly lacerated and disfigured."

U. S. ROAD BUREAU CHIEF URGES APPROPRIATION TO AVOID EMPLOYMENT SLUMP

In his report to the Legislature under date of February 23, 1934, Thomas H. MacDonald, Chief of the United States Bureau of Public Roads, said concerning a future program:

"The extension of the public works highway program that will hold employment without a precipitous drop during the latter months of the year 1934 and through 1935, merging into employment for the year 1936 comparable with that existing in more normal times through the operations of the regular Federal-aid program plus the State-financed construction and maintenance program, **will require an additional grant of around 375 millions now under the public works legislation and provision for 125 millions under the Federal-aid legislation for the fiscal year 1936.**

"Since 1916 the Federal government and the States have been engaged in a cooperative relationship which has extended to all the States and to every community in each State. There are two vital reasons why this relationship should be continued. One is the providing and maintaining of essential facilities. The other is the influence of the Federal government in sustaining as extensive employment in this field as is consistent with continuously supportable expenditures.

"It is essential that employment opportunities of dimensions reasonably equal to those existing before the present emergency programs must be offered in the highway improvement and conservation field. This field offers a continuous opportunity for employment in the providing, perfecting and upkeep of facilities which are intimately related to the social and economic life of the whole Nation."

According to the ads in the health magazines, obesity seems to be the mother of invention.—*New Brunswick (Ga.) Pilot.*

"What's Helen doing?"

"Making a shrimp salad."

"I didn't know we had any shrimps in the house."

"We haven't, but there is one coming to call on her this evening."

How the San Francisco End of the Grea

SAN FRANCISCO, a city of quaint cable cars and surface street railways, will enjoy its first experience in elevated railways, as well as elevated automobile highways, with the coming of the San Francisco Oakland Bay Bridge.

The bridge comes to San Francisco at a height of 175 feet over the famous Embarcadero, that stretches along the harbor from which ships sail to all parts of the world.

So high is the bridge above the street level, it is pointed out by State Director of Public Works Earl Lee Kelly, that the Palace Hotel of San Francisco could be slipped in under the bridge without even the top of its flagpole touching the bottom of the lower bridge deck.

SHORT RAMP FOR TRUCKS

The lower deck of the bridge first touches ground on precipitous Rincon Hill, approximately one-quarter of a mile inland from the bay shore. Here the traffic of the lower deck —that is, two interurban car tracks and a heavy truck roadway—branches out to the north on elevated structures.

The truck roadway goes immediately to street level with a ramp only one city block long, but the interurban car elevated trestle will extend probably half a mile off the bridge proper into the heart of San Francisco.

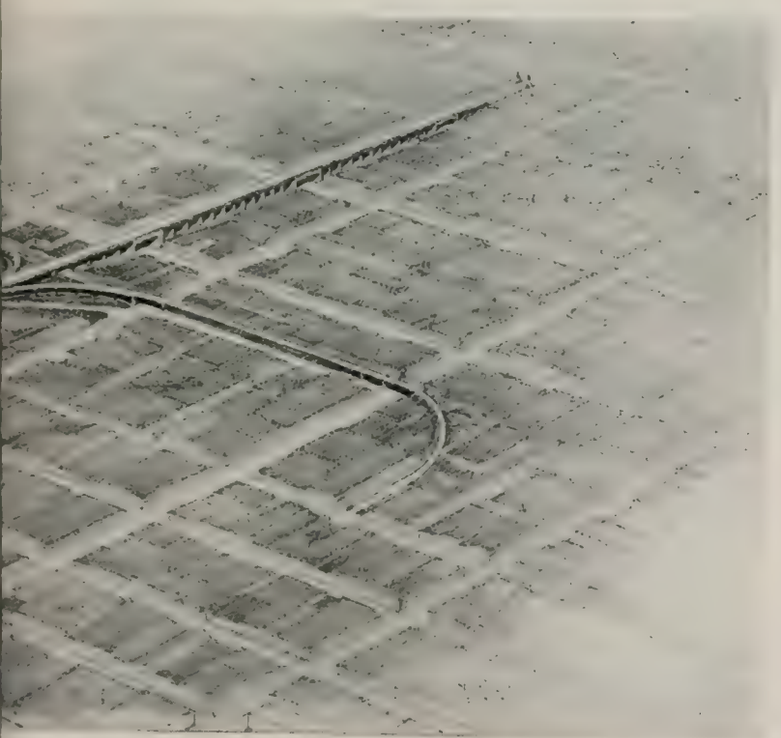
The route of this interurban elevated railway has not yet been selected by Chief Engineer C. H. Purcell and his staff, but it is sure to be an imposing addition to the appearance of San Francisco in the district through which it is routed.

OFF AND ON ramps together with the main entrance Bridge are shown in this picture v

TWO TOP DECK ARTERIES

The upper deck of the bridge will not touch ground until it has proceeded 4200 feet west of the top of Rincon Hill. Here it comes down to level and the bridge ends at Fifth Street between Harrison and Bryant.

Bay Bridge Will Look When Completed



in San Francisco of the San Francisco-Oakland Bay
xception of the interurban car loop.

However, two more arteries extend off the top deck for those motorists who do not wish to drive a mile west of the San Francisco bay shore in order to cross the bay.

For the eastbound motorists going to Oakland a curved ramp starts on Fremont Street at Harrison, going south, turns west, then north, and then east, joining the bridge on top of Rincon Hill, so that the motorist is on the right-hand side and does not cross the swiftly moving stream of bridge traffic.

For the San Francisco bound motorist who does not wish to be brought to ground level at Fifth and Harrison streets, a curved ramp takes off the upper deck on Rincon Hill and proceeds along Essex Street to disperse its traffic where Clementina Street comes out on First Street, just south of Market, the main artery of San Francisco.

FIRST ELEVATED HIGHWAYS

These ramps take off the bridge at an elevation more than 100 feet high, which is the height of a 6-story building.

The construction of this remarkable addition to San Francisco's skyline with its first elevated highways is under the jurisdiction of the State Division of Highways of the Department of Public Works and is under the immediate direction of District IV thereof, of which Colonel John H. Skeggs is District Engineer.

Work has not started on this job as yet, although the construction company building the cable anchorage on Rincon Hill is also building the viaduct which will carry the bridge from the cable anchorage to the summit of the hill where the approaches properly begin.

The trestles will be supported on steel and concrete columns carefully considered by the bridge architects—Timothy L. Pflueger, Arthur Brown, Jr., and John J. Donovan—so that they will be of pleasing appearance.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 12 APRIL, 1934 No. 4

REDUCES THE DANGER

Motorists who have had occasion to do much driving over highways taken over by the State of California in the so-called "6600 mile" bill can not help having noticed that the State's maintenance crews have tackled the job of maintenance in a different manner than it had been attempted before. In almost every instance they are giving more attention to shoulders and the land immediately adjoining the highway than to the pavement itself. Of course they patch the more urgent spots in the pavement, but to judge from the activities of the maintenance crews thus far, there is a lot more to highways than just the pavement.

One of the first acts of the State crews is to paint a white line along the center of the pavement and to keep it in condition to be readily visible, although this act was delayed considerably on the Santa Cruz-Watsonville highway for some reason or other. Almost no other improvement gives so much aid in driving as this white line.

As the summer days arrive, it will probably be found that the practice of widening the highway shoulders and clearing away the growth along the right of way, while helping ordinary driving and increasing the visibility, also serves as an important factor in fire prevention. Many disastrous fires are directly traceable to careless throwing of lighted matches and cigarettes from automobiles. The State is doing its best to make it impossible for fires to start from this cause—along highways under State control.
—Santa Cruz Sentinel.

Judge: "I can not conceive of a meaner, more cowardly act than yours of deserting your wife. Do you realize that you are a deserter?"

Rastus: "If you knowed dat lady as Ah does, you sho wouldn't call me no deserter. Ah is a refugee—dat's what Ah is."—*Exhaust.*

Authority to Close Grade Crossings is Upheld by Court

AUTHORITY of the Department of Public Works and the California Highway Commission to abandon and close crossings at grade of State highways and railroads, as provided for by Sections 363b and 363o of the Political Code, with the consent and approval of the Railroad Commission of the State of California, as provided for by Section 43b of the Public Utilities Act, has been upheld by Superior Judge J. A. Allen of Tulare County.

In the case of Wills vs. the Department of Public Works et al., a resident of Tulare County obtained a temporary restraining order prohibiting the closing of a crossing which had been superseded by a change in the alignment of a portion of Route 4 of the State highway system in the vicinity of Goshen Junction.

DEMURRER SUSTAINED

The Department of Public Works demurred to the complaint on a number of grounds, particularly on the ground that the matter was without the jurisdiction of the Superior Court and that the complaint did not state facts sufficient to constitute a cause of action.

The department's demurrer was sustained without leave to amend, Judge Allen's order pointing out that the matter of closing grade crossings is within the jurisdiction of the Railroad Commission and its order in the matter reviewable only by the Supreme Court. The decision was rendered after argument of counsel and submission of authorities.

The case is the first court test of the Department's authority in the matter of closing grade crossings and for that reason attracted considerable interest because of widespread public interest in the grade crossing problem.

NO LENIENCY FOR DRUNKS

E. Raymond Cato, Chief of the California Highway Patrol, has issued instructions to all his officers to show no leniency in handling intoxicated drivers picked up on the State highways.

And at the same time he called upon the courts and prosecuting attorneys of the State to see to it that the penalties the law provides for such drivers be imposed alike on the influential as well as the uninfluential offender.

Teacher: Willie, give a definition of home.

Willie: Home is where part of the family waits until the others are through with the car.

Niland-Mecca Road a Relief Project

(Continued from page 4)

WEIRD MUD-POTS, geysers, and fumeroles cover a bubbling, boiling area some twenty acres in extent bordering the Salton Sea that is made accessible by the new highway. The roar of the steam vents can be heard a quarter of a mile away.

out in the sea. The flood channel eroded rapidly, working back from the sea at about one-half mile a day. It was apparent that unless the river could be soon returned to its normal course the channel would soon be cut so deep that the Colorado would permanently flow into Imperial Valley.

Results of the tremendous erosion are shown in the gorge of the New River which for some forty miles is cut to a depth of 50 to 80 feet and a width of 1000 feet. The struggle to turn the river back into the Gulf of California was a most stupendous engineering feat and was finally accomplished by the Southern Pacific Railroad equipment and forces, and the Imperial Valley was saved.

The Salton Sea, which has no outlet, has remained although its level varies somewhat according to the quantity waste and storm water flowing into it. Its shores are the home of many kinds of water fowl.

Another natural phenomenon of the Salton Sea country, which will be made more accessible by the new highway, are the geyser and mud-pot fields about six miles west of Niland. Mud, hot water, steam and gas, bubble and blow from the ground over a space of 20 acres in a marsh bordering the sea. The flow of mud is slowly building craters around some of the openings and the roar of steam can be heard a quarter mile distant. The field is accessible by a fair road which leaves the State highway about one mile south of Niland.

A commercial outgrowth of this field is the carbon dioxide wells, of which there are now six in the vicinity. The gas is found at a pressure of 150 pounds and upon further compression is changed into "dry ice," a very efficient refrigerant. The gas is also stored in cylinders for carbonating beverages. The dry ice should find a ready market in the icing of cars for the long haul to market of the valley's vegetables and fruits.

The North Shore Road reconstruction must be considered as a stage improvement rather than a high type accomplishment for the

(Continued on page 32)

Early Opening of Trans-Sierra Roads Effected by New Snow Equipment

By **T. W. DENNIS,** Maintenance Engineer

STATE highway snow plows are now working their way up the slopes of the Sonora, Ebbitts, Carson and Tioga Passes, the last trans-Sierra roads still snowbound.

This most unusual early spring condition will be cheering news at least to fishermen, who may now reach their favorite mountain lake or stream on opening day. This situation, however, offers little comfort to water users, who compare the present trace of snow on Donner Summit with last year's 69-inch snow pack.

Contrary to general surmise, the snowfall this season up until January equaled, if not exceeded, that of last winter for the same period. Unfortunately, the usual heavy snowfalls of January and February did not materialize and the season's total was but 70 per cent of that received in 1933 and only 50 per cent of the fall in 1932.

T. W. DENNIS

DONNER CLOSED ONE DAY

Snow removal conditions this year were very favorable, as the storms, while heavy and in some instances sustained, occurred far enough apart to allow ample time for removal between storms. As a result, Donner Summit was closed but one day during the winter, and that at the tag end of a 76-inch snowfall. Equally favorable conditions prevailed on the Bridgeport-Bishop road.

Several new types of snow equipment were tried out this season, the more noteworthy being the large vertical fan truck-mounted rotary, the trailer rotary widening unit, and the heavy high speed "V" displacement truck plow with side wings.

The vertical fan rotary, mounted on a two-axle, four-wheel-drive truck, is operated by an independent power plant. The plant, a Liberty aviation motor, is capable of developing 420 horsepower at 1800 r.p.m. The seven-blade rotor is nine feet six inches in diameter, and is capable of walking through six-foot snow banks of almost ice-like consistency. In operation the unit is backed into the drift, the driver of the truck being guided by a system of bell signals given by the rotor operator.

HANDLES HIGH DRIFTS

The unit, due to its height, is capable of handling high drifts as well as widening. The clean-up is more efficient on deep than shallow banks, since the face of the higher banks forces the carrying of the snow to the side chutes, whereas in shallow cutting the snow has a tendency to fog outward, seriously interfering with the operator's view. This phase has been corrected to some extent by housing the upper portion of the rotor. The great capacity of the plow, its effectiveness on hard packed snow, its vertical reach, all warrant consideration, and it should provide a very competitive unit in the rotor field.

The trailer widening rotary is a comparatively recent development especially adapted to locations where restricted storage impedes removal. The four-foot rotor is trailed on an offset hitch by a truck after the fresh snow has been bladed to the roadsides. It will widen banks up to five feet in height, throwing the snow a considerable distance off the road.

ECONOMY EQUIPMENT

The clean-up however, is somewhat loose, as a small amount of snow either falls back of or is thrown outward into the roadway by the rotor. The power plant consists of a Waukesha motor capable of generating 114 horsepower at 1800 r.p.m. This unit effects a real economy, lessening equipment investment under conditions normally requiring an expensive truck-mounted rotary.

(Continued on page 32)

SNOW FIGHTING equipment opening Echo Summit on the Placerville-Lake Tahoe highway. Nos. 1 and 2—Railroad type rotary breaking through a four-foot drift. This machine operates backward into the drifts. No. 3—"V" type push plow bucking a drift. No. 4—View of operating end of the big railroad type rotary doing a little cleaning-up work.

New Road Abolishes Tortuous Route to Sausalito Ferries

(Continued from page 2)

the Northbay communities for extension of the same type of improvement on through the city of Sausalito toward the ferries.

NRA FUNDS HELPED

After careful consideration a program was arranged whereby NRA funds became available to the point that the California Highway Commission were able to undertake the additional work of completing the second contract from Napa Street to a terminus at Water Street, a short distance from the automobile ferries, and the northerly terminus of the commercial or business district of down-town Sausalito. This short extension of the improvement is entirely on new rights of way and eliminates all of the dangerous and outmoded types of highway.

Caledonia Street will no longer serve through State highway traffic. The new highway has been continued southerly on a new right of way immediately adjacent to the tracks of the Northwestern Pacific Railroad. The work, as above stated, required the removal of many houses and commercial establishments and has materially changed the picture of Sausalito to the motorist entering it from the north.

Caledonia Street formerly was taxed heavily by local and through traffic in serving the local commercial houses and will continue in the future to only serve the business interests of Sausalito. Work on this latter contract was under construction during the past winter months and is entirely completed and opened to traffic.

The total length of pavement constructed on the second contract was .39 mile. The total cost to the State for grading and paving in the second contract will be approximately $60,000. The total expenditures involved in the two contracts from Waldo Point to Water Street in Sausalito will be approximately $246,000, the expenditure of which has permitted the Highway Commission to bring to a terminus the heavy reconstruction work along the Redwood Highway between Santa Rosa and Sausalito.

Conductor (helping stout lady on car): "Yer should try yeast, mother, ter 'elp yer rise better."

Stout Lady: "Take some yourself, lad, and then ye'd be better bred."

Employment Given 100 Men Per Day on this State Job

(Continued from page 12)

This contract is financed through the National Recovery Act and is affording a large amount of unemployment relief for this vicinity. About one hundred men a day are carried on the contractor's pay rolls. With the exception of supervisory positions, all employed are working not more than thirty hours a week, as provided by the statutes of the State of California.

The grading activities on this work have progressed very satisfactorily and except for the great amount of swamp excavation encountered no difficulties have been experienced. A certain amount of swamp excavation had been anticipated in connection with this work, but as construction progressed springs and undersurface water channels were evident in poor ground at several locations that gave no indication of moisture on the surface. It was considered best to remove this unsatisfactory material, install underdrains, and backfill with suitable material. This required the removal of over 22,000 cubic yards of unsatisfactory swamp material and the placing of approximately 4200 lineal feet of perforated drain pipe and backfilling with suitable selected material.

COMPLETED NEXT MONTH

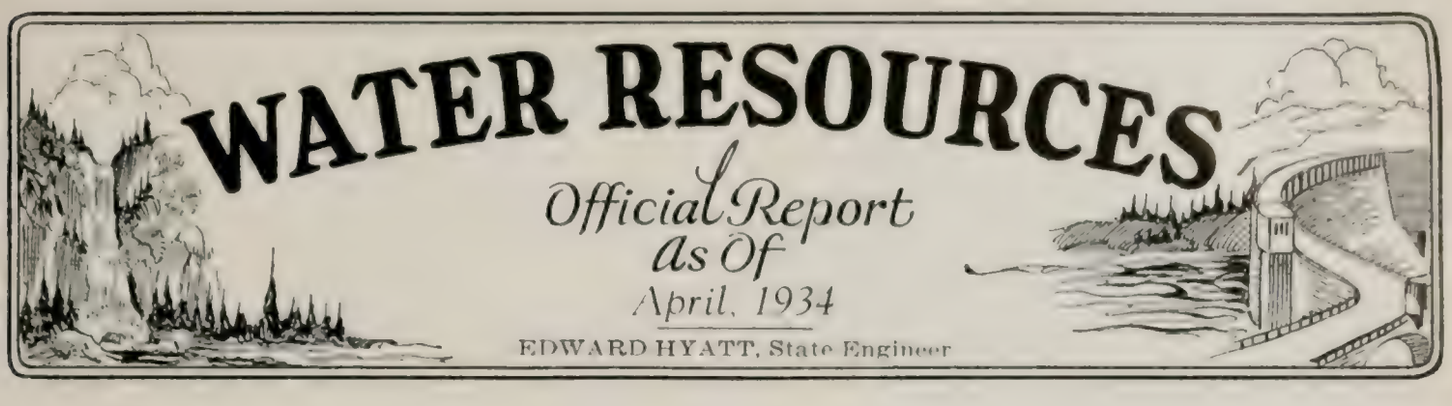
The coarse aggregates for Portland cement and asphalt concrete are being obtained by the contractor from mine dumps in the Ophir District, about five miles easterly from the construction. They are then hauled by motor truck to crushers installed alongside the work about midway from the ends of the project. The fine aggregate is to be obtained from a local creek a short distance from the site of the work.

The contract for this work was awarded September 20, 1933, and is scheduled for completion May 29th this year. The contract progress is satisfactory, and at this time grading and structure installations are practically complete. It is expected that paving will commence about April 15 or 20.

J. D. Greene is resident engineer in charge of construction for the State.

"Dearest," sighed the young man, "couldn't you learn to love me?"

"I might," said the girl, "I learned to eat spinach."



The prospect for another exceptionally dry year remains unchanged through lack of additional heavy rain and snowstorms during the past month. A check of snow and precipitation in the Sacramento-San Joaquin drainage area shows conditions but little better than in 1933 when the seasonal stream flow was only 46 per cent of normal. The outlook is a matter of serious concern for water users according to the monthly report of the State Engineer.

News of the irrigation districts, dam construction, flood control and reclamation work, cooperative topographic mapping and other activities of the division are contained in the report which follows:

IRRIGATION DISTRICTS

Work has consisted of analyzing and tabulating data furnished in reports of irrigation districts for the year 1933, preparatory to the publication of Bulletin No. 21-E, the fifth annual report by the Division on Irrigation Districts in California.

California Districts Securities Commission.

Among the matters before the Districts Securities Commission at its March meeting were the following:

Waterford Irrigation District requested approval of refunding plans for basis of loan from RFC.

Byron-Bethany Irrigation District requested that its recently voted refunding bonds be certified.

La Mesa, Lemon Grove, Spring Valley and Santa Fe Irrigation districts applied for approval of expenditures in connection with their refunding plans.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Under CWA project No. S-502-X-138, clearing in the American River overflow channel has continued during the period with a force varying from 30 to 19 men, and was completed on about March 24th, working a total of 2400 man-hours.

Resubmitted applications have been approved for CWA work in Yolo, Sutter and Yuba counties, but no men have been made available except in Sutter County as mentioned above.

Sacramento Flood Control Project—Bank Protection.

Work under the State-Federal cooperative program for permanent bank protection has continued under the U. S. Engineer Office at Sacramento, in Reclamation District No. 108 and Reclamation District No. 1500.

Resubmitted CWA applications were made by the Reclamation Board and approved as follows:

Yolo County, Project No. YO-SLF-503-X.
Sutter County, Project No. SU-SLF-503-X.
Yuba County, Project Uo. YU-SLF-503-X.

No work has been done under these projects on account of the inability of the county directors to assign men.

Mokelumne River.

Clearing on the Mokelumne River from New Hope bridge to Woodbridge in San Joaquin County has continued under the directoion of this office, CWA Project No. SJ-50-X, with a crew decreasing in size from 60 to 24 men. The work on the left bank has been completed to Woodbridge and a start has been made on clearing the right bank downstream toward Dry Creek.

Under CWA Project No. SAC-1003-X, Sacramento County, work has been proceeding under the direction of this office, in clearing the right bank of the Mokelumne upstream from the New Hope landing bridge along the McCormack-Williamson tract and clearing the Burton Slough By-pass channel between the McCormack-Williamson tract and Reclamation District No. 1002. Rssistance has been rendered during the entire period by the U. S. Engineer Office's snagboat "Yuba." Two crews of 30 men each and one crew of 16 men are employed, making a total of 1800 man-hours per week.

Pajaro River.

Under the supervision of this office work commenced on clearing the channel of the Pajaro River under CWA Projects No. 502-MT-X and No. 502-SCR-X, Monterey County furnishing 23 men and Santa Cruz County 12 men. The work so far has been confined to the tidewater section of the river below Watsonville and excellent progress has been made.

WATER RIGHTS

Supervision of Appropriation of Water.

During the month of February, 24 applications to appropriate water were received, 5 were denied and 12 were approved. In the same period 7 permits were revoked and 5 passed to license.

On October 1st progress reports were requested of 1280 permittees and between that date and March 1st

(Continued on page 29)

Report Covers Ten Years Work on the State Water Plan

THE release is announced by State Engineer Edward Hyatt of Bulletin No. 29, of the series of reports issued by the Division of Water Resources, Department of Public Works. This publication is one of the most important volumes presented on the State Water Plan. It represents the results of over ten years intensive study of water problems in the San Joaquin River Basin.

Included in the report are details regarding the available water supply; the area, location and quality of agricultural lands; the history and present status of irrigation, flood control, navigation and hydroelectric power developments; the utilization of surface and ground water supplies; an estimate of the area of lands suitable for irrigation.

TWO PLANS PRESENTED

The major units of an engineering plan for ultimate development, regulation and utilization of water resources of the basin are described as well as a plan for initial development, comprising units immediately required to meet deficiencies in water supply for present developments and needs in the valley.

Because of the dependence of San Joaquin River Basin upon the Sacramento River Basin for supplemental waters to meet its full requirements, the plans for both initial and ultimate development in the two basins are interrelated and interdependent and, therefore, have been considered together as one unified project.

FIRST TO BE BUILT

The units proposed for immediate development of the initial State Water Plan include the Kennett and Friant reservoirs, the San Joaquin River-Kern County Canal, the Madera Canal, Magunden Edison pumping system and the Contra Costa County conduit. This development would furnish adequate water supplies for present needs in the Sacramento Valley, Sacramento-San Joaquin Delta, Upper San Francisco Bay region, and upper San Joaquin Valley.

It would increase the degree of flood protection, improve navigation on the Sacramento River, and incidentally would generate a large block of hydroelectric energy.

Edna—What kind of a driver is Clarence?
Olive—Terrible—All he grasps is the steering wheel.

Road Boosters of 1911 Hooked up Panama Canal in Propaganda

THE ARCHIVES of the California Highway Commission contain some interesting exhibits of road boosting propaganda that were indulged in when the State highway system was in process of organization. One of these exhibits is a 12-page illustrated pamphlet issued in 1911 by the old Placerville and Sacramento Pioneer Road Club presenting an "Appeal for a State Highway along the Old Pioneer Route from Sacramento to Placerville via Folsom, Clarksville, Shingle Springs, El Dorado, and Diamond Springs."

The cover page carries a picture of a fine four-horse stage coach showing gentlemen in top hats and ladies in bonnets and furbelows being whisked at top speed over a dirt road and labeled "The Past, 1849." Contrasting with this early day equipage is a picture of an up-to-date automobile of 1911 vintage without top or windshield, raising a lot of dust as it dashes over a road, the driver and a lady companion protected by goggles, linen dusters, et cetera. This picture is labeled "The Present, 1911"; and the future in the then distant 1915 is pictured by a large question mark.

PANAMA CANAL CONNECTION

In an elaborately worded preamble the boosters hooked up their road as a connection with the Panama Canal in bringing commerce to that section as follows:

"In honor of our Forefathers, the Pioneers, who from pleasant, peaceful homes on the slopes of the Atlantic or the fertile valley of the Mississippi, braved the hardships, toil, suffering, privations and danger in crossing a continent to lay the foundations of this Occidental Commonwealth, we present this preamble in defense of the title of our Organization.

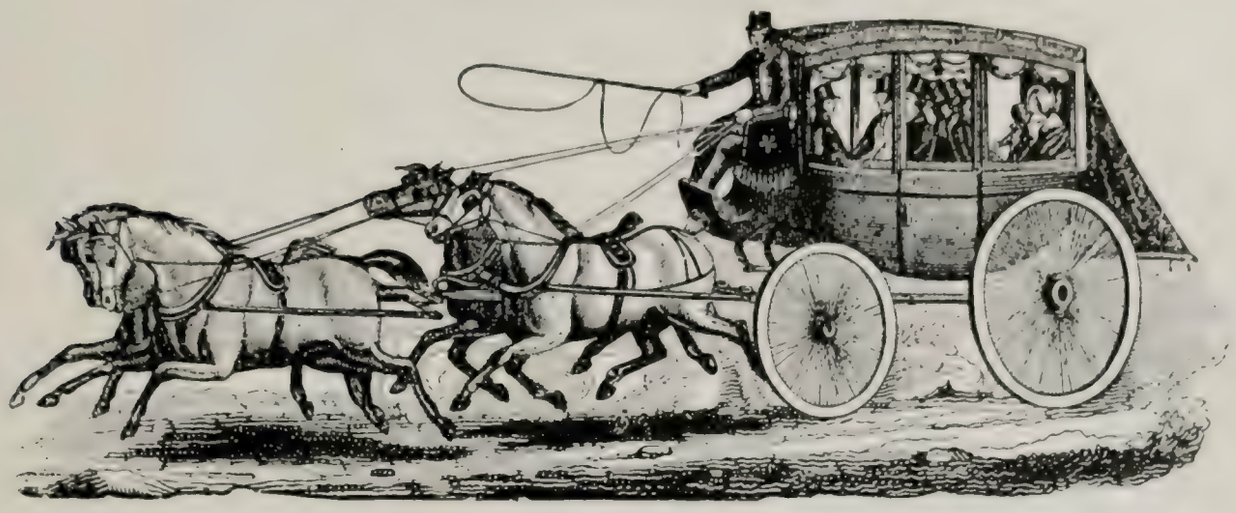
"We contend for recognition of the old landmarks, for the road our forefathers traveled, so wisely located by the old pioneers that this generation can not offer a better route. We contend for the Old Pioneer Trail for those with gray hairs still with us, who can conduct the Honorable Board of State Highway Commissioners or anyone over this grand old trail, afoot, as many of them came, and follow every deviation of this, the only road that has made this section what it is and what it is destined to be upon the completion of that mighty commercial highway—the Panama Canal. It is submitted to this Commission and their consulting engineer whether we are to retain this route as an imperishable monument of utility in honor of its founders, or whether they prefer to consign to the use of posterity a route without a history and in every essential inferior to the time-honored Pioneer Emigrant Road."

ROAD WAS ADOPTED

Their appeal was made for the purpose of having their route taken into the State highway system under the first bond issue of $18,000,000 enacted by the Legislature in 1909.

The enthusiastic boosters had the satisfaction of seeing their efforts crowned with success. The route they proposed was adopted and became a State highway. With a few minor changes of alignment it is the route known today as State Highway No. 11, extending from Sacramento through Folsom and Placerville to Lake Tahoe.

1849



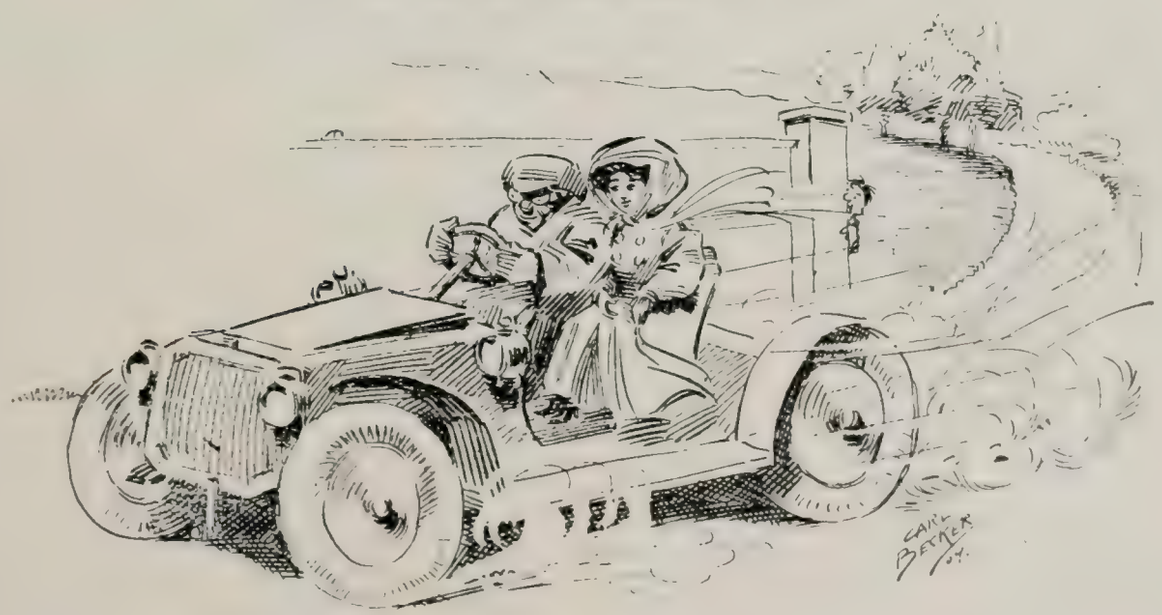
PAST

Appeal for State Highway along the Old Pioneer Route from Sacramento to Placerville via Folsom, Clarksville, Shingle Springs, El Dorado, and Diamond Springs.

OLD PLACERVILLE & SACRAMENTO

PIONEER EMIGRANT ROAD CLUB

1911



PRESENT

OLD ROAD BOOSTER CIRCULAR issued 23 years ago emphasizing pictorially the need of a bigger and better highway between Sacramento and Placerville to meet the advance in transportation facilities from the stage coach of 1849 to the speed demon auto of 1911 and handle the commerce that was coming through the Panama Canal.

New Trans-Sierra Highway Scouted to Join Owens and San Joaquin Valleys

By **R. M. GILLIS,** Acting District Engineer

ONE of the most interesting roads from a scenic and engineering standpoint, included in the 6800 miles of county roads taken into the State Secondary Highway System by the last Legislature is a route over the high Sierra ridge between Tulare and Inyo counties that will eventually link Death Valley and Mount Whitney, lowest and highest spots in the United States on a new cross-State tour from the Nevada line to the coast.

In the legislative enactment, Senate Bill No. 563, this road is designated to run from State Highway Route No. 4 near Tipton via Porterville and Camp Nelson to State Highway Route No. 23 near Lone Pine and is now known as State Route No. 127. Thus it will connect the Golden State Highway through the San Joaquin Valley with the East of the Sierras Highway through Owens Valley.

Existing roads from Tipton to Porterville, 20 miles, and from Porterville to Camp Nelson approximately 36 miles on the west side of the Sierras together with 12 miles of dirt road that zigzags up the eastern slope were taken over for maintenance by the State as traversable roads constituting a part of the route.

From Camp Nelson across the Sierras to the Owens Valley, approximately 60 miles, it is a "paper road" that exists only on the map.

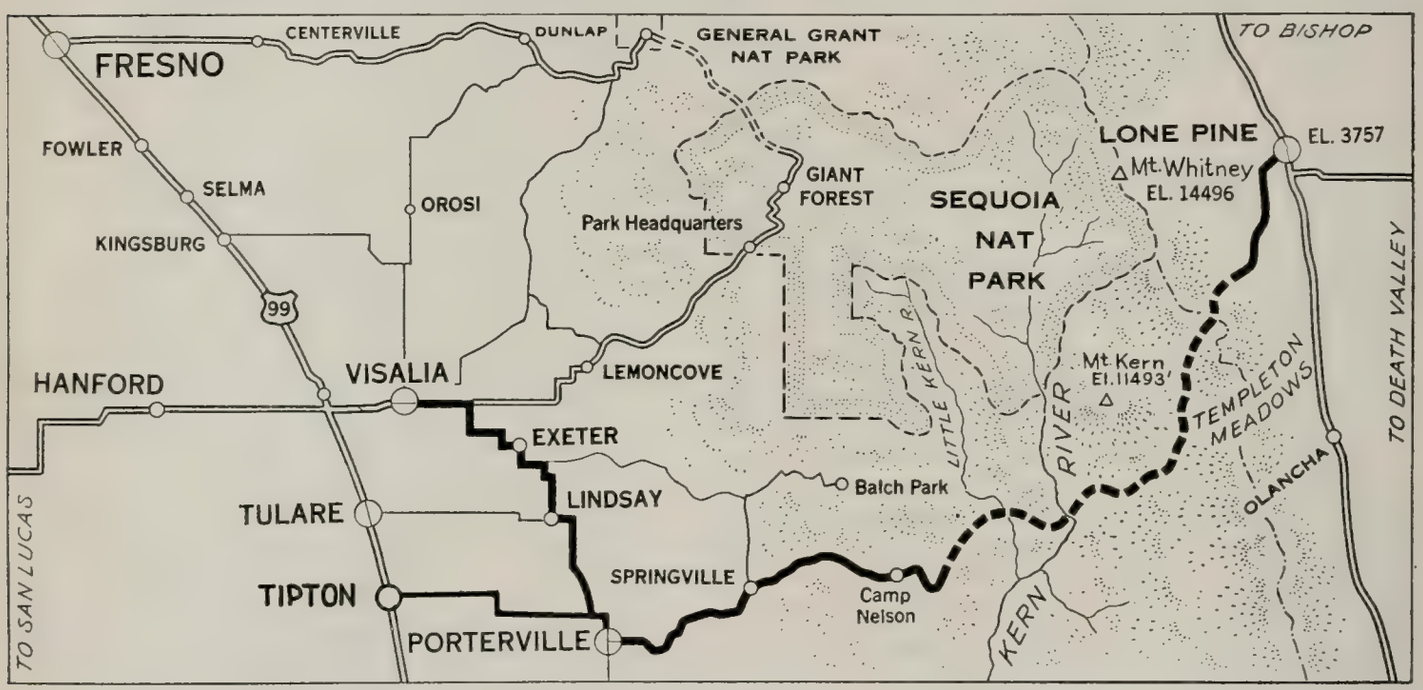
LONG NEEDED CROSSING

The route has long been advocated by Tulare and Inyo counties for the following reasons:

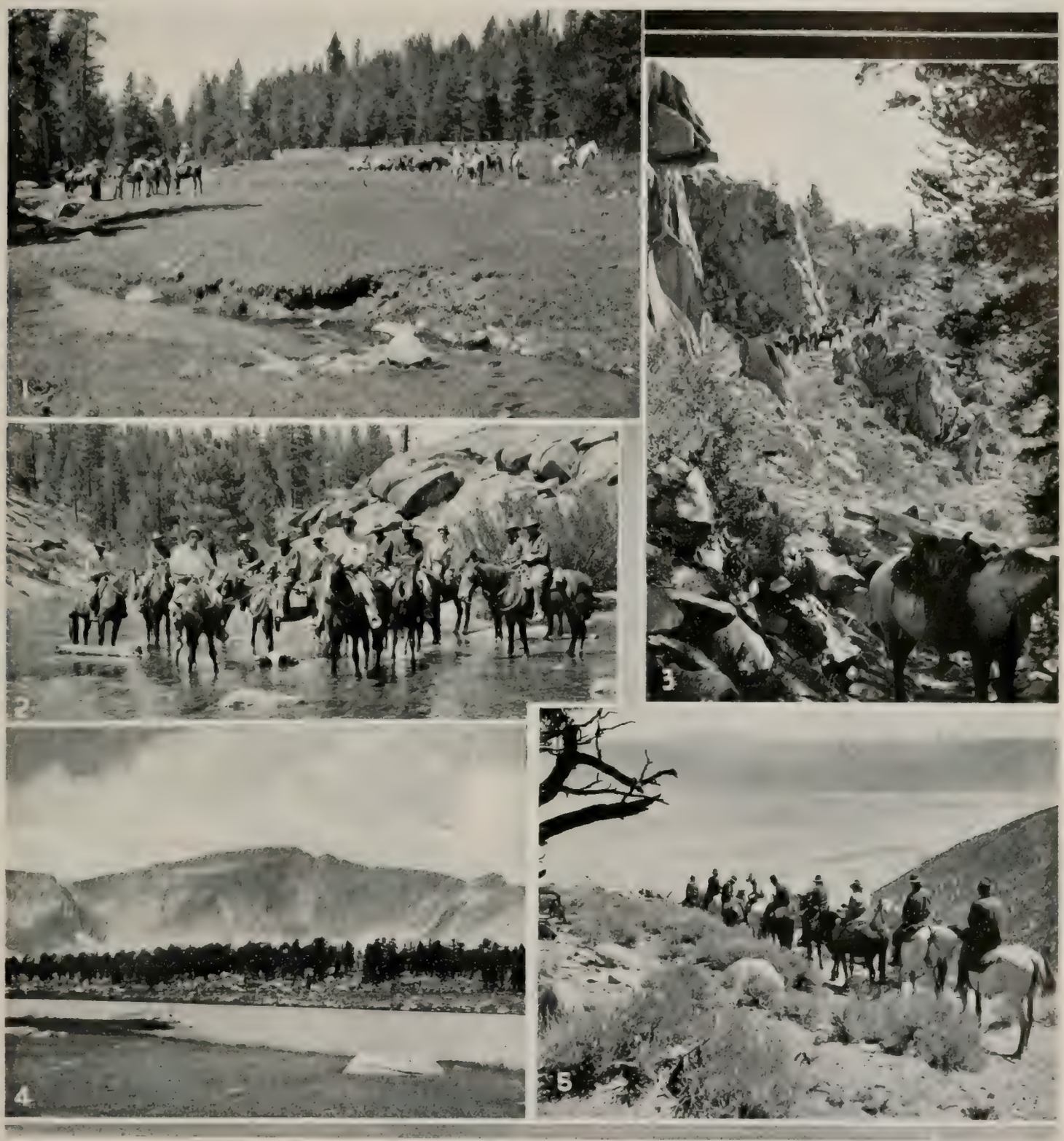
I—It will provide a trans-Sierra route that can be used during at least six months of the year and will be intermediate between Tioga Pass on the north and Walker Pass on the south. Approximately 175 miles separate these two passes between which no highway crossing now exists.

II—It will furnish a more direct route from the Owens Valley into the center of the San Joaquin Valley and open up a great hunting, fishing and recreational area in the heart of the high Sierra abounding in primeval forests of giant sequoia and pines, beautiful mountain meadows, rushing rivers, golden trout streams and numerous large lakes now only accessible by pack train over horseback trails.

The maximum elevation reached by the road will be about 10,000 feet and it will take the



HEAVY BLACK AND DOTTED LINE shows approximate route of new highway taken by scouting party on horseback trip made over the Sierras last fall.



RUGGED COUNTRY was traversed by the scouting party across the high Sierra section of the proposed State highway route between Lone Pine and Porterville. No. 1—Long Canyon meadows. No. 2—Crossing the Little Kern River. No. 3—In Little Cottonwood Canyon. No. 4—Mt. Langley and one of the Cottonwood lakes. No. 5—Beginning descent into Owens Valley.

motorist to a point within 20 miles of Mt. Whitney, 14,496 feet, where, it is expected, a connecting road will eventually be built to the foot of the peak.

The Sierras, at the proposed crossing of this new route, as at all other points, offer a fairly easy approach from the west but drop very abruptly on the east side. The most difficult problems of location and construction will therefore be encountered in the 6000-foot drop from the high mountains down to the Owens Valley.

No definite routing of the projected highway can be decided upon until the Division of Highways has made the necessary reconnaissance surveys but a scouting trip was made last fall from Camp Nelson over the proposed route by interested citizens of San Joaquin and Inyo counties and automobile club officials who invited representatives of

(Continued on page 28)

Roads and Trails Cut 1933 Forest Fire Loss

Fewer scenic forest areas in California were desolated by fire last year than for many years of the past, says a report from Regional Forester S. B. Show. California's fire record for 1933 was the best in 10 years, except for 1930 when wind and humidity helped to hold fire hazards in check, it is declared.

Notwithstanding the average hazardous weather conditions of last year, only 75,354 acres were burned over in the State's 18 national forests as compared to the preceding 10-year annual average of 217,990 acres. This represented a cut of more than 80 per cent in fire-fighting costs, or a saving to taxpayers of about $330,000 in addition to the value of watershed, timber, recreation and grazing land saved from flames.

The C. C. C. was credited by Show as being largely responsible for this saving in fire losses. Through their efforts, 2500 miles of roads and truck trails and 300 miles of firebreaks were constructed and maintained during 1933. It is pointed out that inadequate roads and firebreaks in Santa Barbara National Forest were responsible for more acreage being burned in that one area alone during the past two years than in all the other 17 national forests of the State.

That roads and truck trails are absolutely essential in cutting the time of the initial attack on a fire from hours to minutes is well illustrated in one case where four miles of road in the Angeles National Forest made a difference of 30 minutes instead of two hours in transporting 500 C. C. C. boys to a fire. This enabled the saving of 1000 acres of watershed cover estimated to be worth $500,000 to Pasadena.

It is confidently believed that by the close of 1934 C. C. C. workers will have advanced the work of forest protection 10 years over the former rate of progress in California.

There are two general classes of trucks operating on the highways—those which are privately owned and operated which constitute about 86 per cent of the total and those which are operated for hire which constitute the other 14 per cent. About 9 per cent are contract haulers—that is, they carry for particular shippers by special contract and about 5 per cent are common carriers.

When Jones showed his wife the fish he caught she said: "Don't try to put that over. Mrs. Smith saw you in the fish shop."

"Sure she did," said Jones. "I caught so many I had to sell some."

PAVEMENTS BUILT BY MAYANS 1500 YEARS AGO IS DISCOVERED

That permanent paved roads were a goal of ancient civilizations has been further shown in a recent discovery by an expedition in Yucatan sponsored by Carnegie Institute.

Roads 30 to 34 feet wide, built of stone and cementing mortar, were found. These roads were built 1500 years ago by the Mayans. There is a resemblance between the construction of these roads and those of the early Romans. They were the crude forerunner of the modern concrete road.

The roadway was excavated to hardpan, then retaining walls 2 to 8 feet high were built of large stone blocks, set in mortar. Between the walls, boulders were laid, weighing hundreds of pounds. Layers of smaller stone were laid on top of the boulders. Over these was spread a layer of finely broken stone, rolled and pounded into a hard, level surface. This was finished with a smooth, hard coat of cementing mortar.—*Concrete Highways and Public Improvements.*

NEW TRANS-SIERRA HIGHWAY TO JOIN OWENS AND SAN JOAQUIN VALLEYS

(Continued from page 27)

the Division of Highways to accompany them. The latter included Assistant Deputy Director of Public Works Morgan Keaton; Fred Grumm, Engineer of Surveys and Plans and R. M. Gillis, Acting District Engineer of District VI. The Automobile Club of Southern California was represented by Field Secretary Carl McStay and Chief Engineer Earnest East.

THREE-DAY TRIP

The party spent three days in the saddle journeying across the mountains by way of Kern Flat, the Little Kern River, Jordan Hot Springs, Templeton Meadows, crossing the headwaters of the South Fork of the Kern to Mulkey Pass, thence to Cottonwood Lakes, Golden Trout Camp and Horseshoe Meadows, there connecting with the road into Owens Valley.

When this new highway over the Sierra is built motorists can travel from the Nevada State line at Beatty, down into and across Death Valley, over the Panamint Mountains to Darwin and Lone Pine in Owens Valley, up over the Sierras within the shadow of Mt. Whitney down into San Joaquin Valley to Tipton and thence to the coast by way of either the Cholame or Coalinga laterals.

Survey Shows Less Snow than in 1933

(Continued from page 23)

reports were received in 1166 cases. These reports have been analyzed and the cases forwarded for appropriate action.

On October 15th reports were requested covering 333 projects under license and on March 1st reports had been received on 260 cases. These reports have likewise been analyzed and various cases forwarded for appropriate action.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

A check of the snow and precipitation in the Sacramento-San Joaquin drainage shows considerably less snow than at this time a year ago but the seasonal precipitation to March 1st was slightly better than a year ago. The seasonal stream flow in 1933 in the Sacramento-San Joaquin drainage was only 46 per cent of normal so that with 1934 following such a dry year and with the precipitation and snow conditions practically no better, the outlook for summer stream flow in 1934 is little better than in the extreme years of 1924 and 1931. With this prospect it is a matter of serious concern that the water users shall subscribe the necessary funds so that the Water Supervisor work can be under way very shortly.

Since the comparatively small peak flow of the Sacramento River at Sacramento in the latter part of February, the river has gradually dropped to a present flow of about 20,000 second-feet.

Salinity tests of samples taken at Bullshead Point, Collinsville and Antioch on March 14, 1934, showed the following results in parts of chlorine per 100,000 —Bullshead Point 260, Collinsville 3, Antioch 3.

DAMS

In southern California, work on Pine Canyon dam has been completed; Bouquet Canyon Dam is practically completed, so far as the work of this office is concerned; and the alterations of Mulholland Dam, designed to materially increase the safety of the structure and relieve apprehension from the minds of property owners below, are nearing completion.

Construction of the San Gabriel No. 1 and El Capitan dams is in progress.

Application was filed on March 15th for enlargement of the Lake Orinda Dam in Contra Costa County. This structure is an earthfill and the raise proposed will increase the height of the dam 5 feet and the capacity of the reservoir approximately 30 per cent. The raise is to be accomplished by adding material to the upstream slope. The crest width will also be increased. Alterations to the spillway are included in the work.

FEDERAL COOPERATION

Cooperative Topographic Mapping.

Advance sheets of the Huron, Guijarral Hills, El Rico and Chatam Ranch Quadrangles are now available. The Huron and Guijarral Hills Quadrangles cover areas in Fresno County surveyed in 1933 and are on a scale of 1:31,680 with a 5-foot contour interval. The El Rico and Chatam Ranch Quadrangles cover areas in Tulare Lake Bed, Kings County, surveyed in 1932 and 1933. They likewise are on a scale of 1:31,680 with a contour interval of 5 feet.

Final sheets of Venice, Pearland, Littlerock, Little Buttes, Esparanza and Adobe Quadrangles are now available.

This topographic work was done by the Topographic Branch of the U. S. Geological Survey in cooperation with the county of Los Angeles. All sheets except the Venice Quadrangle cover areas in northern Los Angeles County and the field work was done in 1930 and 1931. The sheets are published on a scale of 1:24,000 with a contour interval of 5 feet in the valley areas and 25 feet in the mountainous areas.

WATER RESOURCES

South Coastal Basin Investigation.

Field work on the South Coastal Basin investigation continued along routine lines during the present month.

CWA Surveys—Kennett and San Joaquin Valley.

Work on the survey of Kennett Reservoir and the line through the canyon is being prosecuted by CWA forces. Plans are also under way to start surveys in the San Joaquin Valley with CWA forces on which it is expected to employ approximately fifty men.

THEY BELIEVE IN SIGNS

Law abiding Woodlanders have been stopping religiously at Court and Lincoln streets stop signs where stopping is unnecessary. Consequently these painted stripes were burned off Thursday to prevent too strict adherence to an obsolete law.

Who says the American people only vote for laws to break them? Or perhaps local citizens have a greater sensitiveness for a white painted STOP staring up from the pavement than their fellow Americans.

At any rate, city street crews were busy Wednesday with blow torches melting off the painted signs and again making Court Street an unmarred boulevard.—*Woodland Democrat.*

"Good morning, Mrs. Kelly," said the doctor, "did you take your husband's temperature, as I told you?"

"Yes, doctor, I borrowed a barometer and placed it on his chest; it said 'very dry,' so I bought him a pint o' beer an' he's gone back to work."—*Boston Transcript.*

Highway Bids and Awards

FOR MARCH

ALAMEDA COUNTY—In Emeryville, at the Paraffine Company's Plant, East Bay Approach to San Francisco-Oakland Bay Bridge, consisting of subway with ramps and wing walls, drainage system and pumping equipment. District IV. Bundesen & Lauritzen and Delta Dredging Co., Pittsburg, $35,211; Fredrickson & Watson Const. Co., and Fredrickson Bros., Oakland, $38,428; Ben C. Gerwick, Inc., San Francisco, $42,115; M. B. McGowan, Inc., San Francisco, $42,485; Barrett & Hilp, San Francisco, $43,517. Contract awarded to Healy-Tibbitts Const. Co., San Francisco, $26,433.

BUTTE COUNTY—Approaches to Pine Creek Bridge, about 13 miles north of Chico, to be graded and surfaced with bituminous treated crushed gravel or stone. District III, Route 3, Section D. E. F. Hilliard, Sacramento, $13,865; Hemstreet & Bell, Marysville, $14,932. Contract awarded to A. G. Raisch, San Francisco, $12,441.

KERN COUNTY—Between one mile and two miles south of Delano, about 1.1 mile to be graded and surfaced with bituminous treated crushed gravel. District VI, Route 4, Section F. L. A. Brisco, Arroyo Grande, $29,158; Griffith Co., Los Angeles, $31,875; Tiffany Const. Co., San Jose, $32,030. Contract awarded to Granite Const. Co., Ltd., Watsonville, $27,339.

LOS ANGELES COUNTY——Eight structures on N Street in City of Los Angeles. District VII, Route 60. Oscar Oberg, Los Angeles, $66,989; Byerts & Dunn, Los Angeles, $64,677; Kovacevich & Price, Inc., South Gate, $63,906; George Hess, Los Angeles, $61,777; Bannister-Field Co., Ltd., Fred E. Potts Co., Los Angeles, $60,482; R. R. Bishop, Long Beach, $60,668; Oswald Bros., Los Angeles, $67,717; Lynch-Cannon Engineering Co., Los Angeles, $63,793; Dimmitt and Taylor, Los Angeles, $66,723. Contract awarded to C. Bongiovanni Const. Co., Los Angeles $58,888.

LOS ANGELES COUNTY—Overhead crossing in the city of Los Angeles over tracks of Southern Pacific Company spur to Hercules Powder Company. District VII, Route 157. Bannister-Field Co. Ltd., & Fred E. Potts Co., Los Angeles, $41,939; J. R. Lippincott, Los Angeles, $49,983; C. Bongiovanni Const. Co., Los Angeles, $48,923; George Hess, Los Angeles, $53,883; Dimmitt & Taylor, Los Angeles, $43,717; Andy Sordal, Long Beach, $49,017; Theo. A. Beyer Corp., Los Angeles, $45,716; Sharp and Fellows Contracting Co., Los Angeles, $46,716; H. M. Baruch Corp., Ltd., Los Angeles, $49,257; Byerts & Dunn, Los Angeles, $44,353. Contract awarded to J. L. McClain, Los Angeles, $41,587.

LOS ANGELES COUNTY—At San Gabriel River Bridge near Whittier, constructing timber pile current deflectors at down stream ends of five bridge piers and clearing channel of obstructions. District VII, Route 2, Section D. Wm. Hess, Los Angeles, $5,522; Geo. J. Bock & Son, Los Angeles, $5,722; Creighton, Inc., Los Angeles, $5,827; R. R. Bishop, Long Beach, $5,961; Lynch-Cannon Engineering Co., Los Angeles, $6,330; Gist & Bell, Los Angeles, $6,340; George Hess, Los Angeles, $6,860. Contract awarded to E. G. Perham, Los Angeles, $5,370.

MADERA COUNTY—Between Hawkins School and Oakhurst, about 4.1 miles grading. District VI, Route 125, Section D. Larsen Bros., Sacramento, $152,730; Fredrickson & Watson Const. Co., Fredrickson Bros., Oakland, $170,036; Hemstreet & Bell, Marysville, $159,334. Contract awarded to Yglesias Bros., Inc., San Diego, $131,357.

MERCED COUNTY—Between westerly boundary and 3½ miles east, about 3.3 miles to be graded and surfaced with bituminous treated crushed gravel or stone (road mixed). District X, Route 32, Section A. George Pollock Co., Sacramento, $198,096; United Concrete Pipe Corp., Los Angeles, $250,724; Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland, $173,869; Union Paving Co., San Francisco, $224,463; Peninsula Paving Co., San Francisco, $197,179. Contract awarded to von der Hellen & Pierson, Castaic, $153,769.

RIVERSIDE COUNTY—Between Indio and Shavers Summit, about 24.3 miles to be graded and central portion treated with fuel oil. District XI, Route 64, Sections H, I. Macco Const. Co., Clearwater, $571,048; Griffith Co., Los Angeles, $615,712; Jahn & Bressi Const. Co., Inc., Los Angeles, $519,338; United Concrete Pipe Corp., Los Angeles, $534,243; Bechtel Co., San Francisco $546,286. Contract awarded to Fredrickson & Watson Const. Co., and Fredrickson Bros., Oakland, $456,436.

SACRAMENTO COUNTY—Widening bridge across American River at 16th Street one mile north of Sacramento and grading and surfacing approaches. District III, Route 3, Section B. Rocca and Caletti, San Rafael, $160,911; M. B. McGowan, Inc., San Francisco, $158,434; Bodenhamer Const. Co., Oakland, $149,776. Contract awarded to Lord and Bishop, Sacramento, $126,319.

SAN BERNARDINO AND RIVERSIDE COUNTIES—Painting about 608 miles of traffic stripe. District VIII. B. G. Carroll, San Diego, $5,223. Contract awarded to Edwin Anderson, San Francisco, $4,894.

SAN DIEGO COUNTY—Three bridges, one across South Sweetwater Channel, one across Otay River and one across North Sweetwater Channel. District XI, Route 2, Section F. Lynch-Cannon Engineering Co., Los Angeles, $65,713; George Hess, Los Angeles, $64,690; Walter Trepte, San Diego, $72,594; Byerts & Dunn, Los Angeles, $70,108; Sharp and Fellows Contracting Co., Los Angeles, $66,407; R. R. Bishop, Long Beach, $66,793; Jerome K. Doolan, Pasadena, $69,669. Contract awarded to V. R. Dennis Const. Co., San Diego, $63,903.

SANTA BARBARA COUNTY—Two bridges in the City of Santa Barbara, one across Mission Creek near Figueroa Street consisting of one 38-foot span, the other across Mission Creek near Micheltorena Street consisting of one 40-foot span. District V, Route 2. Bodenhamer Const. Co., Oakland, $51,498; J. E. Haddock, Ltd., Pasadena, $57,186; Weymouth Crowell Co., Los Angeles, $45,293; George Hess, Los Angeles, $48,483; Jerome K. Doolan, Pasadena, $45,694; Theo. A. Beyer Corp., Los Angeles, $50,712; Oscar Obert, Los Angeles, $50,519; R. R. Bishop, Long Beach, $47,919; Sharp and Fellows Contracting Co., Los Angeles, $47,226; C. Bongiovanni Const. Co., Hollywood, $51,676. Contract awarded to Lynch-Cannon Engineering Co., Los Angeles, $44,439.

SANTA CLARA COUNTY—Between San Felipe and Bell Station, about 0.4 mile roadway excavation. District IV, Route 32, Section B. Rocca & Caletti, San Rafael, $12,000; O. G. Ritchie and W. E. Karstedt, San Jose, $11,300; W. H. Hauser, Oakland, $12,000; J. L. Conner, Monterey, $9,120; Meyer Rosenberg, Inc., San Francisco, $11,600; Contoules Const. Co., San Francisco, $11,200; A. J. Raisch, San Francisco, $11,600; Garcia Const. Co., Irvington, $12,400; Granite Const. Co., Ltd., Watsonville, $14,500. Contract awarded to L. C. Karstedt, Watsonville, $6,800.

SISKIYOU COUNTY—Between Moffett Creek and Forest Home, about 7.5 miles to be graded and surfaced with untreated crushed gravel or stone. District II, Route 82, Section D. Contract awarded to Hemstreet & Bell, Marysville, $48,361.

STANISLAUS COUNTY—Between one-half mile south and one north of Turlock, about 2.2 miles to be graded and paved with asphalt concrete. District X, Route 4, Section A. Heafey-Moore Co., Oakland, $93,722; A. Teichert & Son, Inc., Sacramento, $94,212; United Concrete Pipe Corp., Los Angeles, $94,401. Contract awarded to Union Paving Co., San Francisco, $74,555.

TULARE COUNTY—Between Visalia and Merryman, about 8.1 miles to be graded and paved with asphalt concrete. District VI, Route 10, Section C. Southern California Roads Co., Los Angeles, $299,622; Union Paving Co., San Francisco, $306,198. Contract awarded to Basich Bros., Torrance, $265,811.

VENTURA COUNTY—Between Beetox and Santa Clara River, about 3.3 miles to be graded and paved with asphalt concrete. District VII, Route 2, Section C. Griffith Co., Los Angeles, $56,790; C. O. Sparks, Los Angeles, $55,581; Basich Bros., Torrance, $48,790. Contract awarded to Oswald Bros., Los Angeles, $46,670.

YOLO AND SACRAMENTO COUNTIES—"I" Street Bridge across Sacramento River, widening curves to approximately 22 feet. Lord and Bishop, Sacramento, $11,950; Campbell Construction Co., Sacramento, $13,250. Contract awarded to M. A. Jenkins, Sacramento, $11,850.

H. A. Hopkins Given Appreciation Dinner for Public Service

CHAIRMAN HARRY A. HOPKINS of the California Highway Commission was the recipient of a remarkable testimonial of appreciation for public services rendered by him to his city and the State as an unsalaried official when more than 300 people from all sections of California attended a banquet given in his honor at Taft, March 16th, under the joint auspices of the Taft Chamber of Commerce, Kiwanis and Rotary clubs.

Stanley Abel, Kern County supervisor, was toastmaster and delegations were present from San Francisco, Santa Barbara, Salinas, Tulare, Fresno, Maricopa, Fellows and McKittrick. The speakers included Director Earl Lee Kelly of the Department of Public Works, O. A. Kommers, former president of the Kern County Chamber of Commerce, Highway Commissioner Timothy A. Reardon and other State and civic officials and business associates and friends of the guest of honor.

ARRANGED AS SURPRISE

Mr. Hopkins had just returned from a trip to Salt Lake City where he represented Governor Rolph at a conference of Western States governors and was entirely surprised and greatly moved by the demonstration of esteem, particularly when it climaxed in the presentation to him of a fine watch.

The following editorial comment on the affair appeared in the *Coalinga Daily Record* under the caption "Yardstick of Citizenship":

AN EDITOR'S TRIBUTE

"By their good deeds ye shall know them."

One of the finest tributes that it has ever been our privilege of witnessing paid to a living man—we have heard and seen many paid to the departed—was tendered Harry A. Hopkins at Taft, last Friday evening, when more than three hundred citizens from all over the State assembled at an appreciation dinner in his honor.

The affair was tendered Hopkins in recognition for his service, not only to Kern County, but to the remainder of the State as well, as chairman of the State Highway Commission, for as such the Taftian has recognized the desires and needs of every section of California.

Men from all parts of the valley and State gave verbal expression of their high regard to and for the man who "came from the sagebrush" to become the most popular person ever to have served as chairman of the State commission.

It was a demonstration long to be remembered by every one present and one that will stand out in the hearts and memories of Mr. and Mrs. Hopkins as the most pleasurable occasion of their lives.

Their friends paid tribute to them while they were living and made them realize that after all a service to others is of more value and greater satisfaction than service to one's self.

The lives of Mr. and Mrs. Hopkins have been exemplification of that type of citizenship.

They have been measured by their good deeds.

H. A. HOPKINS

Three Engineers Win Promotions in Rank

Several promotions in rank of members of the engineering staff of the Division of Highways have occurred in the past month.

James G. Standley, who has been acting as Administrative Assistant Engineer on the headquarters staff, has been made Principal Assistant Engineer.

James W. Vickrey, who has been Acting District Engineer of District 1 at Eureka, has been given the full rank of District Engineer and the same honor has been conferred upon R. M. Gillis, who has been Acting District Engineer at Fresno.

Ever notice what wonderful poker hands you get when you are playing bridge?

Investigation Shows 55% Loss of Water in Santa Ana Canyon

EDWARD Hyatt, State Engineer, announces the release of Bulletin No. 44, dealing with one phase of the work of the Division of Water Resources in the South Coastal Basin Investigation and entitled "Water Losses under Natural Conditions from Wet Areas in Southern California."

Part I of the bulletin deals with "Consumptive Use of Water by Native Plants Growing in Moist Areas of Southern California" and consists of (1) determinations of such use in the valley of Santa Ana River and in the Coastal Plain of Orange County; (2) along the Mojave River near Victorville, and (3) the loss of water in Coldwater Canyon near Arrowhead Springs.

SALVAGING PLANS FEASIBLE

Part II of the bulletin deals with "Ground Water Supply and Natural Loss in the Valley of Santa Ana River between Riverside Narrows and Orange County Line" and consists of a determination of the amount of water lost in that area which might be recoverable in whole or in part.

This bulletin shows definitely the large waste of water now occurring in such areas. It does not point to methods of salvaging the water but in view of the large value of water in southern California there is little doubt that with proper development this water could be saved in large part at a cost which would make it economically feasible. The water in the mountain canyons could be saved by diverting the stream and piping it down the canyon in the same way as the city of San Bernardino now operates in Devil Canyon.

In areas such as that above the Bunker Hill Dike along Santa Ana River the water now wasted could be saved by lowering the water table and the same is true of the area below Riverside Narrows in the Lower Santa Ana Canyon. In this latter area the report shows that there are 4040 acres of land subject to these losses and that in 1931, 17,500 acre-feet was lost in this area while in 1932, 16,300 acre-feet was lost.

LOSS OF FIFTY-FIVE PER CENT

During the period from May to September these losses averaged in the summer of 1931–32, 55 per cent of all the water that entered the valley between Riverside Narrows and Prado, or in other words the average summer loss was 1640 inches of water and the average loss for the entire two years including the winter also was almost 1200 inches.

The conclusions in both parts of the bulletin are the results of intensive measurements of evaporation and stream flow extending over two or more years.

New "V" Type Snow Plow Proves Fast and Effective Equipment

(Continued from page 20)

The "V" type speed plow, having a five-foot vertical height and eleven-foot wing spread, has demonstrated its effectiveness wherever road alignment permits of fast operation. This plow will handle two to three feet of loose snow without pause, and is capable of bucking through drifts four to six feet in height. The side-wing aids materially in furthering the outward disposal of the snow carried upward by the "V."

This unit is particularly valuable at locations where the season's fall does not exceed six feet, though occasional heavy falls and drifts can be expected.

While the present snow season has been comparatively light, its cost has not been lowered commensurately, as much of the labor and equipment required must be held on hand to meet any emergency which might arise.

NILAND-MECCA ROAD A RELIEF PROJECT

(Continued from page 19)

present. The rather modest $63,000 to be expended over some forty miles of desert rolling trail is expected to widen the roadbed to at least 24 feet, to provide a light gravel layer where most necessary and an oil mix surface 12 feet wide over the entire distance.

The alignment will be greatly improved and guard rail provided on such of the 120 existing small bridges as are usable on the revised alignment. Drainage on new grade will be secured by dips until adequate funds are available for structures.

Under day labor the work was started without delay and is proceeding largely with hand and team methods to conform with its intention as a relief project. It is expected that the construction will be completed by July 1, 1934.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.----------Governor

EARL LEE KELLY----------Director

MORGAN KEATON----------Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
FRANK A. TETLEY, Riverside
DR. W. W. BARHAM, Yreka
C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON (Acting), Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

J. W. VICKREY, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego
General Headquarters, Public Works Building, Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights
A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
GORDAN ZANDER, Adjudication, Water Distribution

DIVISION OF ARCHITECTURE

GEO. B. McDOUGALL, State Architect, Chief of Division
P. T. POAGE, Assistant Chief
W. K. DANIELS, Administrative Assistant

HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Draftsman
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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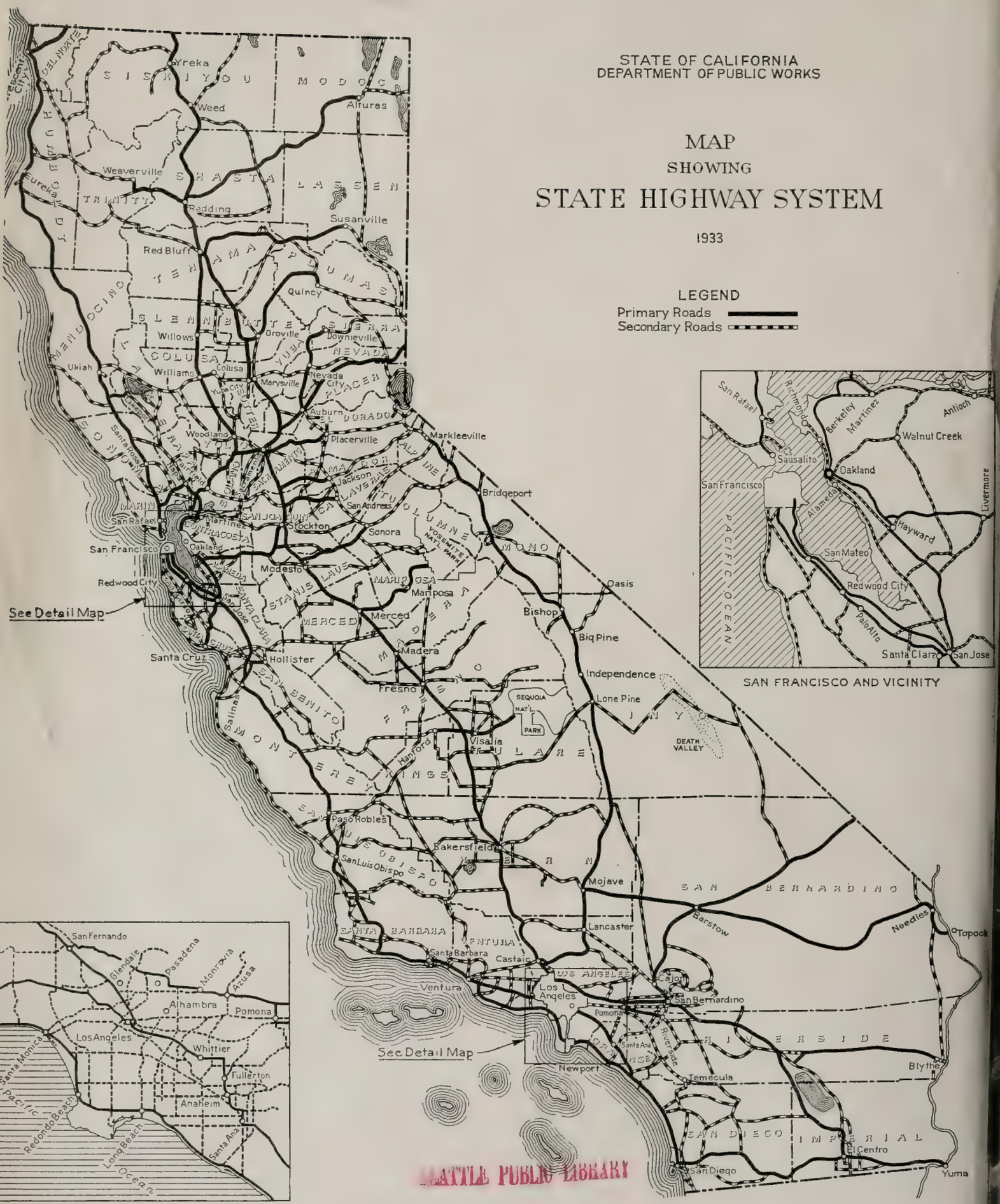
CALIFORNIA STATE PRINTING OFFICE
HARRY HAMMOND STATE PRINTER
SACRAMENTO, 1934

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM
1933

LEGEND
Primary Roads
Secondary Roads



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HIGHWAYS AND PUBLIC WORKS

Castle Crags, Shasta County
on Pacific Highway, State Route No 3

Official Journal of the Department of Public Works

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How Highway Routes within Municipalities are Selected for Quarter Cent Revenue Improvement by Agreements with Local Governments in Compliance with Legislative Act

By **L. V. CAMPBELL**, Engineer of City and Cooperative Projects

LEGISLATION was enacted in 1933 providing for the expenditure of one-quarter cent per gallon of the gasoline tax within municipalities. The act provides that the expenditure in each city shall be made in the proportion that the population in each city bears to the total population in all such cities in the State, the population to be determined by the last Federal census.

The act further provides that the expenditure of the quarter-cent revenue within cities shall be made first upon the State highways or portions thereof within cities for acquisition, construction, maintenance or improvement. In the event the amount of money allocated to any one city is greater than necessary to adequately maintain and improve to adequate standards all State highways within such city, then any surplus amount may be expended on other streets of major importance, as may be agreed upon by the Department of Public Works and the legislative body of such city.

L. V. CAMPBELL

The act also vests in the California Highway Commission jurisdiction and authority with respect to any State highways lying within any municipality, and imposes the duty upon the commission of designating and determining locations and connecting portions either through or around the municipality of all State highways, the natural course of which runs or passes into or through any municipality, unless any such route or routes in a municipality be specifically described by law.

In working out the procedure for the expenditure of the quarter-cent fund, it has been the intention of the Department to cooperate with the cities to the fullest extent.

Since the quarter-cent gas tax allocation was to be expended first upon the State highway routes within a city until they were adequately provided for, one of the first essentials in the administration of the act was the designation of the State highway routes within municipalities. During the many years of activity of the Division of Highways, studies have been made of possible routings into or through cities, connecting with State highways, so that a carefully considered plan was available of State highway routings through cities as the State highway system existed prior to 1933.

INTENSIVE STUDY MADE

In the same statute the Legislature added 6724 miles of additional State highway, making a large number of additional routes

(Continued on page 10)

HYDRAULIC GIANTS MOVING A MOUNTAIN are shown at work on the realignment of the Redding-Eureka Highway in Trinity County over Oregon Hill between Weaverville and Junction City. The 8-inch giant is hurling 2 tons of water per second at a velocity of 2 miles per minute against bank 425 feet distant moving 5200 cubic yards per day. Lower right photo shows hole washed in 202.5 hours flow. Upper pictures show completed road and construction operations on either side of the mountain.

Washing Away a Mountain in Path of Highway a Record Hydraulic Operation

By **F. W. HASELWOOD,** District Engineer

WHEN the California Highway Commission on April 29, 1932, settled the long pending uncertainty over the routing of that portion of the Redding to Eureka highway between Douglas City and Junction City in Trinity County by adopting the route through Weaverville rather than down the Trinity River, and later included in the budget for the current biennium $100,000 to start the work, it passed to the engineering department as knotty a problem in location and construction as ever confronted the Division of Highways.

For, as is known to every motorist who has boiled all of the water out of his radiator, or worn out his brakes, that mountain known as Oregon Hill lies about midway between Weaverville and Junction City, and the climb from either direction is plenty steep and long.

Oregon Hill is about 1200 feet above Weaverville and 1500 feet above the mouth of Oregon Gulch, about a mile east of Junction City where the route again reaches the Trinity River. Oregon Hill offers no support for a highway location except at right angles to the direction it ought to be going.

FIRST HYDRAULIC MINE

Oregon Gulch is a historic name in California. The first hydraulic mining began in Trinity County shortly after the gold rush to Oregon Gulch in the early fifties, and the La Grange Hydraulic Mine was actively operated from 1862 to 1918, during which time over 100,000,000 cubic yards of gravel and overburden were removed. Oregon Gulch is filled to indefinite depths with gravel from this mining, and far below the surface of this debris lies the old town of Oregon City.

The mine gets its name from Baron Le Grange, a Frenchman, who acquired it in 1892. Since any location must cross property owned by the La Grange Placer Mines for about four miles, including the crossing of Oregon Hill, this mine became an important factor in the location problem.

The formation at Oregon Hill has been described geologically as "a great ancient channel of auriferous gravels along the bed of a river which, millions of years ago, in the geological age known as Cretaceous, flowed southwesterly through what is known as a portion of Trinity County in the Siskiyou Mountains. Later an uplift diverted the stream to a new channel, the modern Trinity River, and left the channel of gravels high in the hills about 1000 feet above the modern stream. Later smaller streams and glaciers cut across this ancient "channel" and with the aid of further upheaval isolated large masses of the deposit in the original streambed.

Oregon Hill is one of these masses and originally contained about 200,000,000 cubic yards of gold bearing gravel. About half of this remains.

BEDROCK PLANE TILTED

An important characteristic of the area in the old mine pit as it exists at present is a tilted bedrock plane which forms what is known as the north rim of the mine. This plane dips southerly 22 degrees, and its existence is known for a distance of about 3500 feet, although over half is covered by the broken mass of a large slide.

This material overlying it consists of a blue, partly disintegrated schist of varying degrees of hardness, blue clay and yellow clay. None of this overburden carries gold, and the operation of the mine in the few years preceding its closing in 1918 was unprofitable by reason of immense slides of this overburden which continually buried any gold bearing gravel which laid in the bottom of the ravine near the bedrock of the old channel.

In the selection of a route for a highway over Oregon Hill two alternatives presented themselves, one to use the pass occupied by the present road and to develop on the very broken and unstable country south of the mine, and the other to develop a line along the north rim of the mine through a saddle but 25 feet higher than that through which the existing road passes.

TWO ROUTINGS STUDIED

The first routing encountered extremely broken country on both sides of the hill, many

(Continued on page 28)

Director Kelly Pays Fine Tribute to Headquarters Staff of Highway Division

By **EARL LEE KELLY**, Director of Public Works

AS an organization entrusted with the administration of the expenditure of an average of $70,000,000 of State funds each biennium the Division of Highways ranks as one of California's major industries. During its steady growth, since the first highway bond issue of 1909, this function of State government has labored consistently to bring this great commonwealth of the Pacific slope to its present position of leadership in road construction methods and its interlacing system of over 14,000 miles of State highways to a place of preeminence among similar systems throughout the Union.

The supervisory unit of this important State organization is the Headquarters Staff and it is through the various departments of this unit that the planning, financing, construction and maintenance of State highways are unified and the system developed as a whole. It is the centralized control exercised by the Headquarters Staff, working in conjunction with the Director of Public Works and the California Highway Commission, which is largely responsible for the uniform development of California's great network of State roads.

It was through the Headquarters Staff that the work of the Division was so coordinated that it has been possible to successfully accomplish the unprecedented highway construction program which has been under way in California since last September.

TRIBUTE OF APPRECIATION

And I want to here pay my tribute of appreciation and gratitude to the devoted loyalty and splendid efficiency of the following gentlemen constituting the Headquarters Staff who have worked day and night, giving unstintedly of time and effort to make possible this record breaking achievement in the history of California highways:

Charles H. Purcell, State Highway Engineer.

George T. McCoy, Assistant State Highway Engineer.

James G. Standley, Principal Assistant Engineer.

Richard H. Wilson, Office Engineer.

Thomas E. Stanton, Materials and Research Engineer.

Fred J. Grumm, Engineer of Surveys and Plans.

Charles S. Pope, Construction Engineer.

Thomas H. Dennis, Maintenance Engineer.

F. W. Panhorst, Acting Bridge Engineer.

L. V. Campbell, Engineer of City and Cooperative Projects.

R. H. Stalnaker, Equipment Engineer.

An adequate conception of the task they have performed in the last nine months is best obtained by a review of the results. Such a review reveals:

WORK ACCOMPLISHED

Two hundred sixty-one contracts awarded in the sum of approximately $20,530,200; day labor work and convict road construction amounting to $3,023,700; 18 projects advertised for bids at an estimated cost of $1,267,000, making a total of $24,821,500 for construction projects; maintenance work orders reviewed and approved in the sum of $6,693,700 bringing the total construction and maintenance work to the imposing figure of $31,515,200 for the nine month period.

The monumental task of putting under way this construction program has required consistent and unceasing effort on the part of members of the entire Division of Highways. It has called forth a spirit of cooperation between the several district offices and the Headquarters Staff as well as between the various departments within the headquarters organization, without which successful accomplishment of the program could not have been attained. The fact that it has been "put over" so successfully is, in itself, an epic on the loyalty of this branch of State service to the citizens of California.

ORIGINAL PROGRAM UPSET

The task was not one which was steadily worked up to a climax, but one that broke with breath-taking suddenness. During the late spring and early summer months of 1933 varied factors of important influence on the

(Continued on page 14)

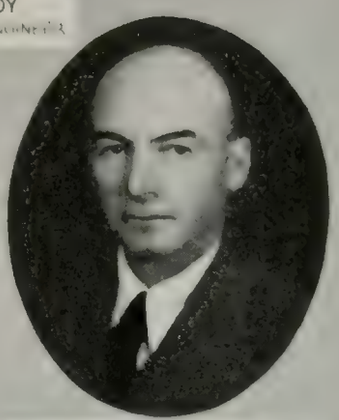
State Highway Headquarters Staff

C H PURCELL
STATE HIGHWAY ENGINEER

GEORGE T McCOY
ASSISTANT STATE HIGHWAY ENGINEER

JAMES G. STANDLEY
PRINCIPAL ASSISTANT ENGINEER

FRED J. GRUMM
ENGINEER OF SURVEYS & PLANS



THOMAS H. DENNIS
MAINTENANCE ENGINEER

THOMAS E. STANTON
MATERIALS & RESEARCH ENGINEER

F. W. PANHORST
SECRETARY & ENGINEER

RICHARD H. WILSON
CHIEF ENGINEER

L. V. CAMPBELL
ENGINEER OF CITY &
FEDERAL PROJECTS

CHARLES S. POPE
DISTRICT ENGINEER

R. H. STALNAKER
EQUIPMENT ENGINEER

Gala Celebration Marks Completion of Burney-Fall River Mills Highway

IN a beautiful wooded mountain glade, bisected by the clear, purling waters of Hat Creek in Shasta County, 2500 men, women and children gathered on Sunday, April 29th, to celebrate the completion of the Burney-Fall River Mills sector of the Redding-Alturas State Highway.

They came in automobiles, many of them long distances from Oregon and Nevada, to participate in festivities attending a two day program of dances and outdoor sports, arranged through Secretary Tom Stanley of the Shasta-Cascade Wonderland Association, that culminated in the highway celebration.

They also came to honor Director Earl Lee Kelly of the State Department of Public Works, a citizen of Redding who was introduced by Vice President Harry E. Thompson of the Redding Chamber of Commerce as "one of California's natural resources and northern California's best friend."

YELLOWSTONE CUT-OFF LINK

The delegation from Oregon were particularly interested in the high standard improvements of this portion of California's link in the projected highway known as the Yellowstone Cut-off, that will afford a special short route through their State and Idaho to the Yellowstone National Park.

The people of California, and particularly of Shasta County, were interested in the fact that the tortuous old road, especially between Cassel and Fall River Mills which passed through lava beds and down into miniature craters, had been supplanted by a high standard modern highway providing more varied and spectacular scenery.

The new highway traverses rugged and primitive country, over easy rolling grades with long tangents and long stretches of straightaway mileage without a curve. It passes through a country that boasts one of the largest stands of virgin timber in the United States.

SAVINGS LIQUIDATE COST

The length of the new construction, including bridges, is 19.1 miles. The length via the old road is 23.3 miles, showing a saving in distance of 4.2 miles. The cost of construction, including the bridges at Hat Creek, Pit River and Fall River was $696,000. The saving in time for the average driver on the trip between Burney and Fall River Mills is between fifteen and twenty minutes which, translated into car mileage economy savings to motorists will, it is estimated, liquidate the cost of the highway in several years.

The major features of the day's program were the speeches by a group of State officials from California and Oregon, an exciting boxing and wrestling card, an Indian dugout race, the baseball game and the picnic lunches with which all regaled themselves at the noon hour.

Director Earl Lee Kelly and guest of honor representing Governor Rolph, and Dr. Irving E. Vining, representing Governor Meier of Oregon, delivered the principal addresses.

DAM PROSPECTS BRIGHT

Speaking of the prospects for the great Central Valley Water Project, Kelly said:

"No one is in closer touch than I with the work for obtaining Federal funds for the Kennett Dam and other units of the water conservation program. And I say to you that the prospects for successful conclusion of the plans for financing the program are better than they were for the San Francisco-Oakland Bay Bridge a short time before the funds were provided for that great structure."

C. C. Cottrell, Highways Bureau Manager of the California State Automobile Association, San Francisco, outlined plans for the continuation of the Yellowstone Cut-off through to Boise, Idaho, and said it would also provide connections to Banff and the Lake Louise region in Canada.

GREETINGS FROM GOVERNOR

Dr. Irving E. Vining brought the greetings of the Governor of Oregon and of the people of the sister State. He spoke of the highway as helping to unite Oregon and California in a common vantage ground of enjoyment of the wonders of nature in the west. California's spirit of loyalty to its own he declared was well known and admired throughout the east and they recognized the truth

(Continued on page 32)

BEAUTIFUL ARBOREAL SETTING of the Burney-Fall River Mills Highway celebration, Director of Public Works Earl Lee Kelly broadcasting and a section of the new highway are pictured above. In the front row of the official group are District Engineer, F. W. Haselwood; Assistant State Highway Engineer, G. T. McCoy; Vice President, H. E. Thompson, Redding Chamber of Commerce; Dr. Irving E. Vining; Earl Lee Kelly; President, E. B. Hall and T. L. Stanley, of Shasta-Cascade Wonderland.

Back Row—Geo. Cunning, A. H. Banwell, A. H. Gronwoldt, Senator H. L. Powers, Wm. Boucher, W. G. B. Chase, J. W. Howe, Frank Durkee, B. K. Snyder, C. J. Fulcher, Geo. Grizzle, and W. A. Gates.

Questionnaire Answers Many Inquiries Concerning California Highway System

By **C. C. CARLETON**, Chief, Division of Contracts and Rights of Way

THE CALIFORNIA Highway Commission and the Department of Public Works are continually receiving inquiries from citizens and various organizations as to the composition and extent of the highway system; how new roads are added; how the gasoline tax revenues are apportioned and may be spent by State, counties and cities; how various official bodies exercise jurisdiction over highway matters and other similar questions.

The last Legislature made many important changes in the laws affecting the State highway system and its financial setup. To supply information in a succinct form in response to numerous inquiries the following questionnaire with answers is published:

Q. How are State highways created?

A. Only by act of the Legislature or by vote of the people on a proposition submitted to them at a state-wide election.

Q. Has the California Highway Commission, itself, authority to create a State highway?

A. No. It is limited to determining the engineering location of a State highway between the key points or the termini designated by the act of the Legislature or the measure voted by the people.

Q. What is the approximate mileage of the State highway system of California at the present time?

A. About 14,000 miles.

Q. How are the State highways of California classified?

A. Primary and secondary.

Q. What governmental agency makes this classification?

A. The Legislature.

Q. What are primary State highways?

A. The Legislature of 1927 declared the main trunk State highways, together with county seat, national park, and certain interstate State highway connections, specifically described in Chapter 794, Statutes of 1927, as primary State highways. The 1933 Legislature designated the San Francisco-Oakland Bay Bridge and approaches thereto to be a primary State highway. There are now 41 primary State highways designated by the Legislature.

C. C. CARLETON

Q. What are secondary State highways?

A. All State highways now or hereafter included within the State highway system other than the 41 primary State highways are and shall be classified as secondary State highways.

Q. What important changes were made in the State highway financial structure by the 1933 Legislature?

A. (a) The Motor Vehicle Fuel License Tax Act of 1923 was amended and the Gasoline Tax Act of 1927 was repealed, resulting in a consolidation act.

1. A three-cent gas tax is imposed on each gallon of motor vehicle fuel.

2. After certain deductions are made, one-third of all moneys in the "Motor Vehicle Fuel Fund" are paid to the respective counties for road purposes.

3. All moneys in the "Motor Vehicle Fuel Fund" remaining after the counties' shares are provided for and the statutory deductions are made are paid into the "State Highway Fund" for State highway purposes.

Q. What other money is deposited in the "State Highway Fund" besides the State's share of the gas tax?

A. All money made available by any law for State highway purposes (including the State's share of receipts from the motor vehicle license

Expenditures Controlled by Law

(Continued from preceding page)

taxes and the taxation of highway transportation companies) is placed in the "State Highway Fund." The only exception is money which may be placed in the "State Highway General Fund," to wit, any money contributed by any county or city for the construction or maintenance of highways, Federal aid road money, or other funds coming under the control of the Division of Highways which are not otherwise specifically appropriated.

Q. How is the "State Highway Fund" allocated?

A. (a) The Department of Public Works is authorized to expend such proportion thereof as the California Highway Commission determines is necessary for:

1. General administration purposes.
2. Maintenance of all State highways, including all traversable highways on authorized State highway routes.
3. Maintenance of highways in State parks.

(b) The remainder of the money in the "State Highway Fund" is allocated and expended as follows:

1. One-half thereof on primary State highways.
2. The remaining one-half thereof on secondary State highways. (Not to exceed 4 per cent of each one-half can be expended in the northern group of counties and the southern group of counties, respectively, as State aid to joint highway districts within the two respective groups.)
3. The California Highway Commission may, in its discretion, expend not to exceed 50 per cent of the primary highway money on secondary highways, and vice versa, when the allotments would otherwise be larger than necessary to meet traffic requirements.
4. As a further flexible provision, either primary or secondary highway moneys may be expended within municipalities on authorization of the California Highway Commission.

Q. What further expenditure must be made from the "State Highway Fund," which was a new policy adopted by the 1933 Legislature?

A. By the provisions of Chapter 767, Statutes 1933, the Department of Public Works is directed to expend annually from the "State Highway Fund" an amount equal to one-quarter of one cent per gallon tax on motor vehicle fuel, within cities, pro rated according to population, for State highway and city major street purposes within such cities.

Q. Referring to the three-cent gas tax, what general distribution results?

A. Roughly speaking, since certain deductions must first be made as above set forth, the State receives one and three-quarters cents, the counties one cent, and the cities one-quarter of a cent, out of each three cents.

Q. Can the State expend more than the cities' one-quarter cent gas tax within cities?

A. Yes. On State highway links within cities it can spend State highway moneys in addition.

Q. How are primary State highway moneys redivided?

A. The State is divided into two groups of counties by legislative act. The 45 northern counties compose one group. The 13 southern counties compose the other group.

Each group receives the proportion of the money that the number of primary State highways within its own limits bears to the total number of miles of primary State highways designated by law.

Thus: The total mileage of primary State highways used at this time as the basis for computation is 4261.9 miles.

In the 45 northern counties there are 2341.6 miles thereof, or a percentage of 54.9 per cent.

In the 13 southern counties there are 1920.3 miles thereof, or a proportion of 45.1 per cent.

Therefore, the northern group is now receiving 54.9 per cent of the primary road moneys and the southern group, 45.1 per cent.

Q. How are the secondary State highway moneys divided?

A. The law provides that they shall be divided equally between the two groups of counties, each receiving 50 per cent of the funds.

Q. What policy has the Legislature of California followed in recent years?

A. The policy of adding new roads to the State highway system only after engineering and economic studies have been made by the California Highway Commission and the State Department of Public Works.

Q. What mileage of secondary State highways was added to the State highway system by the 1933 Legislature?

A. 213 routes, comprising a total of about 6800 miles.

Q. What other policy has the Legislature been following?

A. Equalizing the mileage in the secondary State highway system between the northern and southern groups of counties, as soon as it can reasonably be accomplished. Thus, the 1933 Legislature took a large stride toward equalizing the mileage north and south. There now remains an advantage of but a few hundred miles in favor of the northern group of counties.

Q. Is the State authorized by law to construct portions of State highway within municipalities?

(Continued on page 27)

Project Agreements Made with Cities

(Continued from page 1)

within cities to be studied and determined upon. The California Highway Commission, in cooperation with the Department of Public Works, made an intensive study of the possible routings in all the cities and finally selected tentative State highway routes within municipalities for designation.

After the routings were selected, the descriptions of the proposed routings were sent to the respective cities, with the request that the city council adopt a resolution concurring in the designation of those streets as the State highway routing through that city. In a number of cases, the route of a highway as described by law did not follow any existing street, and in such cases the commission adopted the policy of designating State highway routes along the most feasible routing, following traversable streets open to traffic and approximately on the route as described by law.

In some instances, cities have requested alterations in the routings tentatively selected, and where it appeared that the change was for the best interests of the traveling public, the change has been made.

CITIES' ADVICE SOUGHT

In programming the expenditure of this money and in selecting the projects for improvement, the advice and cooperation of the city has been sought. A form of project statement has been prepared for use of the cities in submitting their statements of proposed expenditure of the quarter-cent gas tax.

The form contains space for showing the streets or sections selected for maintenance or improvement, the condition of the street, traffic conditions, the work proposed, and the plan of financing, together with a statement of funds available; also a statement as to whether the city desires to handle the work itself or wishes the State to do the work. Upon approval of the project, an agreement is prepared for execution by the city and the State.

The department has adopted a policy of cooperating with cities to the fullest extent possible in the expenditure of this money, and has made the procedure just as simple as possible, with due regard to existing laws. Wherever necessary to waive formalities in order to accomplish ends promptly, there has been no hesitation in doing so; but there are certain fiscal matters and regulations that are beyond our control.

MAINTENANCE FIRST OBLIGATION

In programming the expenditure of the quarter-cent fund, the law requires that the maintenance of the State highway routes within cities shall be the first obligation against the quarter-cent gas tax revenue accruing to that city. Before any acquisition, improvement or construction projects are considered, the adequate maintenance of State highway routes within the city limits must first be provided for, either from the quarter-cent fund or from other city funds.

Where the State highways within the limits of incorporated cities were being maintained by the State at State expense prior to August 21, 1933, the State has continued to maintain those streets at State expense. In the maintenance of city streets, it is considered that the quarter-cent fund should be expended only for work between the curbs, and it is not considered proper to expend this money for any work back of the curb line, including the maintenance of street lights, whether overhead lights or electroliers.

LIMIT TO EXPENDITURES

Where the State does the maintenance work on a State highway route within a city, not previously maintained at State expense, the State will expend only the amount of the quarter-cent allocation accruing to the city, and can not supply additional money from the State highway fund if the city's quarter-cent fund is insufficient to provide for adequate maintenance. In such case, the standard of maintenance must be limited to the amount of the quarter-cent fund available, unless the city is willing to contribute the additional money required.

Where the city does the work of maintaining the State highway route, it will be reimbursed for only the actual expenditures, not to exceed the total amount of the quarter-cent gas tax accruing to that city.

Based upon estimates of the gas tax revenue as used in the State highway budget, the quarter-cent gas tax allocation will

Fuel Tax Funds Give Financial Relief

(Continued from preceding page)

GAS TAX PAVEMENT recently completed on "L" Street in the city of Sacramento where State Highway Route No. 4 passes the historic Fort Sutter situated in Sutter Park.

amount to $5,310,000 for the biennium. This amounts to $1.24 per capita. From present indications, the actual collections will probably be somewhat less than the estimated amount, as the gas tax apportionment so far this biennium has been somewhat less than estimated for the corresponding quarters.

ROUTES TO BE SIGNED

Arrangements are being made for the erection of signs directing traffic along State highway routes within municipalities, as rapidly as the work can be accomplished, so that a stranger will be informed of the best and most direct and feasible route through the city. The larger cities have generally made satisfactory provision for State highway traffic entering the city; however, in some few instances in the more sparsely settled districts, the streets have been far from adequate for the traffic they were called upon to bear. In the smaller communities, with fewer resources at their command and the relatively large portion of their streets carrying heavy State highway traffic, the financial burden of providing adequate improvement and maintenance was beyond their means.

The allocation of one-quarter cent per gallon tax on gasoline for expenditure within incorporated municipalities will provide the funds for maintenance in all cases, and will at least permit the gradual improvement of the State highway routes within cities until they are adequate for traffic conditions.

Where a city's finances would permit, it has been suggested that they provide for the maintenance of the State highway routes out of their current funds and apply the quarter-cent gas tax allocation toward the improvement of the State highway routes. It is extremely gratifying to note the number of cities that are acting upon that suggestion.

(Continued on page 22)

Engineers Make Ocean Build Mile of Bathing Beach Along Coast Highway

TWO years ago it was decided to widen State Highway No. 60, generally known as the "Roosevelt Highway" or "Coast Boulevard," where it extends northwesterly along the coast from Santa Monica canyon in Los Angeles County. This strip of coastline affords the most convenient series of beaches for a large section of the metropolitan area and has the largest traffic count of any portion of the State highway system.

Beach frontage that had been set aside for State and county park purposes comprised a large part of this section and it was necessary to provide a wide parking area along the beach side of the highway to prevent traffic congestion: Just north of Santa Monica Canyon the ocean had already washed away most of the beach and at high tide the breakers were menacing the existing highway.

It was decided to protect the highway slopes by building up the beach and at the same time provide a good bathing area along the public park frontage by the use of groins or jetties extending out into the sea.

GROIN PLAN ADOPTED

The successful results of this plan are described in an article in Los Angeles *Times* of March 18, 1934, by Real Estate Editor Charles C. Cohan. Answering the question—"What about Los Angeles Beaches when the metropolitan area's population of almost 2,400,000 shall have grown to three or four times that number?" Mr. Cohan writes:

"Don't worry!"—that's engineering science's bold answer to the question's challenge.

"Is more assurance wanted than just that statement? All right—let engineering science take you by the hand and lead you to the shore about three-quarters of a mile north of the mouth of Santa Monica Canyon.

GREAT ACHIEVEMENT

"What do you see? One of the finest stretches of beach you've ever viewed—almost a mile long, almost 200 feet wide * * * room enough there for a good many thousands of men, women and children.

"And so what? Well, twenty months ago the pounding waves of high tide were washing up against and cutting under the highway there—the famous Coast Highway. There wasn't a vestige of beach along all that 3333-foot stretch of State-owned shore line.

"The State is proud of that highway, knows its tremendous value. S. V. Cortelyou, State Highway District Engineer, boss of the district including Los Angeles County, wanted to save the road, but he didn't defy Old Man Ocean—he just gave him a hint, an affable engineering tip.

FIVE GROINS BUILT

"Engineer Cortelyou had five staunch barriers—their technical name is groins—each built out 200 feet seaward from the shore, each groin 500 feet apart from its neighbor groins.

"Old Man Ocean couldn't batter those groins to bits—they're made of interlocking sheet-steel piling. So very obligingly and steadily he began piling sand against them—a million times more sand against each barrier than there is rice in China. And presto!—there has appeared that fine new beach, a veritable gift from Old Man Ocean who still is extending that beach width, a remarkable demonstration, one of the foremost on record, of what can be done to increase beach space along many a mile of the Los Angeles coastal line.

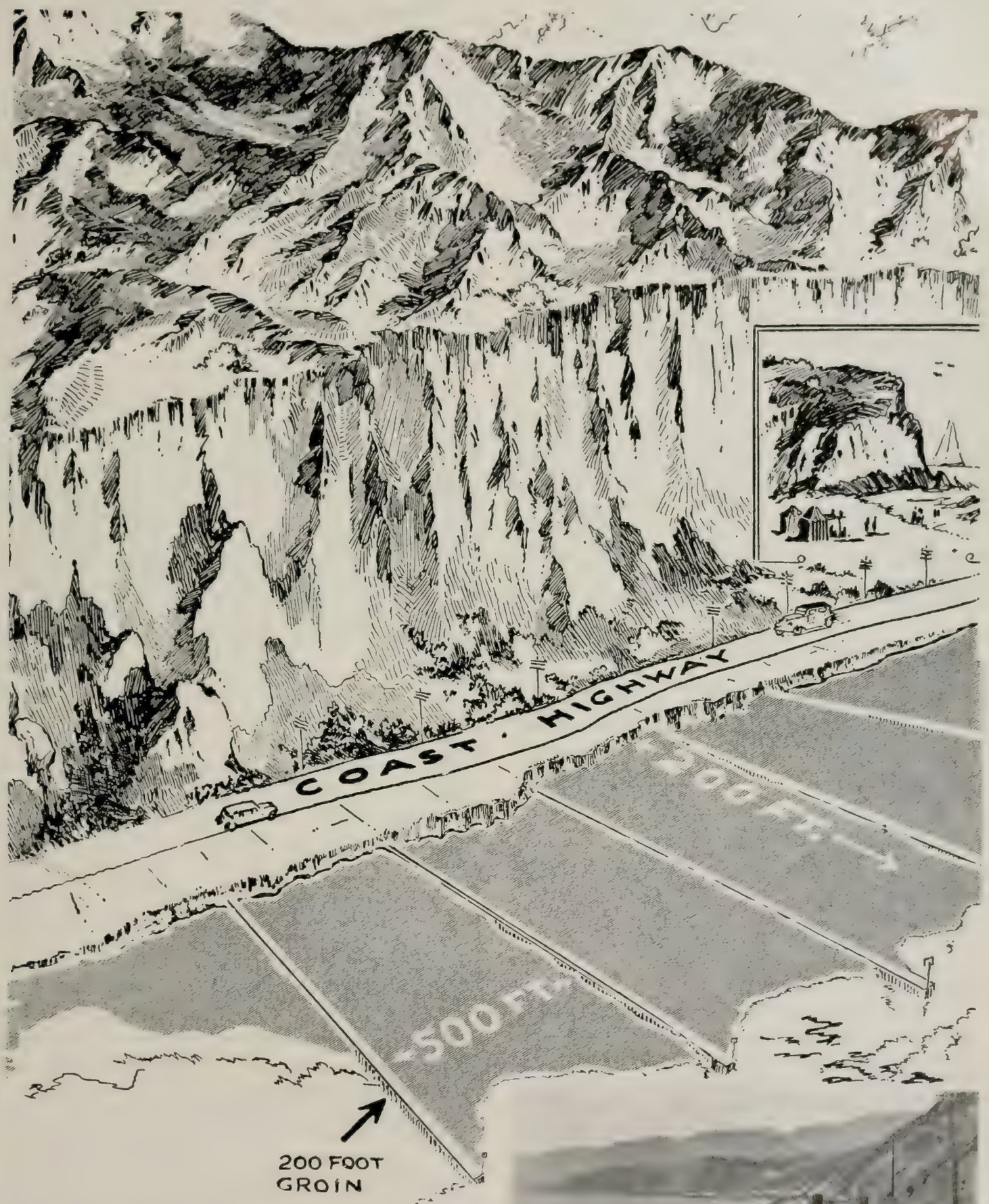
COST ONLY $30,000

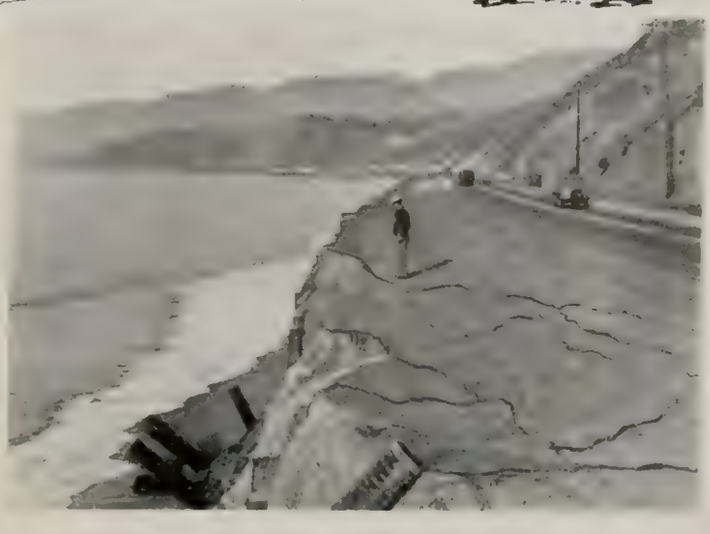
"Oh, yes—and the entire cost of those groins was only about $30,000. The value of the new strand is inestimable.

"This county has seventy miles of coast line—its rugged portions accentuating its renowned beauty, punctuating interestingly its stretches of delightful silver strand.

"This means a lot of beach. But after all there is only just so much coast line—and it's something that never can be extended, when once all, or as much of it as possible, is put in use for public or private purposes.

"So while there never can be any more beach frontage, Old Man Ocean always will be ready to make beaches much larger, as described—and that's a mighty cheerful thing to know."





OLD OCEAN HARNESSED by groins has been toiling for State highway engineers building a fine sandy beach along the Santa Monica Coast where no beach existed. In 20 months it has made a beach a mile long and 200 feet wide as shown by shaded portions of the drawing by Artist Phil Leonard of the Los Angeles Times. It provides a public bathing beach as well as a protection to the highway. Photo shows how the waves were gouging out the highway shoulders before groins were installed.

Staff Worked Double Shifts in Crisis

(Continued from page 4)

State highway situation arose on many sides, necessitating continual readjustment of the setup as ordinarily planned for the current biennium.

Early in 1933, the engineering staff had prepared, and the California Highway Commission had presented to Governor Rolph a proposed biennial budget for highway construction, reconstruction and maintenance for the 85th–86th fiscal years.

This budget was based on the orderly improvement of the then existing State highway system of approximately 7350 miles of roads in accordance with the ten-year plan of development. The Legislature then passed a bill incorporating some 6800 additional miles of county roads into the State system, bringing the total mileage of the system to about 14,150 miles.

NEW LAWS ENACTED

At the same time, one-quarter cent of the State's share of the gasoline tax was allotted by the Legislature for use within incorporated cities. Concurrently, a plan for the diversion of a very sizable portion of the gas tax to other than highway purposes was referred to the people for decision at a special election to be held in June. The result of this election is now history, the people voted unmistakably for highway development.

Congress then passed the National Industrial Recovery Act and California was apportioned $15,607,000 of Federal funds for State highway construction.

It can readily be seen that with these affecting factors rolling up one after the other, a complete revision of the highway setup was necessary and the Headquarters Staff, with the cooperation of the district engineers, labored arduously to prepare an adequate program of construction and maintenance for this doubled highway system on the basis of the total revenues from State and Federal sources.

BUDGET REVISED

The California Highway Commission held innumerable conferences with organizations from many localities and State engineers conferred with city and county officials. The great increase in State road mileage required a complete readjustment and expansion of maintenance activities.

So, with due consideration to the multitudinous factors of a proposed program, the State Highway Engineer prepared, and the Director of Public Works presented to the Commission for approval and adoption a revised budget aimed to provide the most equitable and widely spread development and improvement for the entire State system that was possible.

Activity in the headquarters' office then reached a fever pitch under instructions from Governor Rolph to carry out the President's plea for immediate construction on all public works possible. Plans, specifications and estimates were perpared, and on August 25th, the first advertising day after the several new laws affecting State contracts became effective on August 22d, advertisements were published calling for bids on fifty contracts, estimated to cost approximately $4,018,000.

This meant the complete preparation of adequate specifications and review and revision of plans necessary for the construction of this large number of projects in a week's time. Even with considerable increase in the personnel of the staff of draftsmen and engineers, the task necessitated working day and night.

OFFICE SHIFTS DOUBLED

But this first advertising drive was merely the beginning. The district offices threw crews into the field to rush surveys and doubled office shifts to prepare preliminary plans for future work. The Bridge Department increased its personnel to the point where two shifts were required because of insufficient office space.

Preliminary reports literally rained into the headquarters office from the districts; specifications and plans were whipped into shape, reviewed and approved by engineers of the Surveys and Plans Department, the Testing Laboratory and the Construction Department; proposal forms were printed, and every week saw the total of projects advertised rise with steady rapidity.

The amount of detail work necessary to the successful carrying out of this program is almost inconceivable: calculations of quantities; computations of estimates; inclusion in specifications of Federal require-

Director Kelly Pays Tribute to Work of Headquarters Staff

(Continued from preceding page)

ments and restrictions on construction methods; masses of typing; endless proof-reading; review of plans submitted by the district offices; detailing of special structures; submission of projects and estimates to Federal officials for approval and a thousand and one other phases of highway construction work necessary to the proper preparation of proposals for contracts.

There were delays not under the control of the department that held up the work: the delay of a suit brought to withhold opening bids on a $200,000 contract to test the validity of a law passed by the last Legislature; the delay which caused the cancellation of the advertisement of 13 projects and a month's suspension of advertising on all projects in northern California by a restraining order served on the Department of Public Works in connection with the code of Excavating and Dump Truck Contractors; but, withal, the program has been successfully put over without a mistake of sufficient gravity to materially affect a single contract.

This accomplishment has demonstrated the high efficiency of the Division of Highways organization and the healthy spirit of cooperation existing in all departments, particularly among the members of the Headquarters Staff who, in my opinion, constitute the ablest group of State highway engineers in the United States. California is indeed fortunate in having such a body of highly trained, experienced and competent public officials building her highways and may well be proud of them and their achievements.

OREGON BUILDING FIVE BRIDGES ON PACIFIC COAST HIGHWAY

Another scenic link in the International Pacific Highway from Alaska to Argentina is being forged with construction started on the first of five bridges along the Oregon Coast Highway. A report states that work on all five will be started within the next 75 days. Oregon State Highway Commission is being aided in the construction by a Federal appropriation.

Husband: "I say, if worst comes to the worst I suppose we will have to go and live with your parents?"

Wife: "Not a chance. They're already living with their parents."

HIGHWAY DIVISION RECEIVES COMMENDATION FROM CWA

The following letter was received by District Engineer Wallace from John L. Bacon, Director of Civil Works Administration in San Diego County, commending the work of District XI in their handling of CWA projects.

Mr. E. E. Wallace, District Engineer,
Division of Highways,
San Diego, California.

Dear Mr. Wallace:

I want to thank you for your letter of appreciation of March 27th.

It has been a pleasure to work with the Highway Department because everything they have undertaken has always been so well planned and executed that it makes us feel that really work of a valuable nature has been accomplished in every case.

Very truly yours,

(Signed) JOHN L. BACON,
Director, Civil Works Administration,
San Diego County.

Ten Bridges Under Construction on the Roosevelt Highway

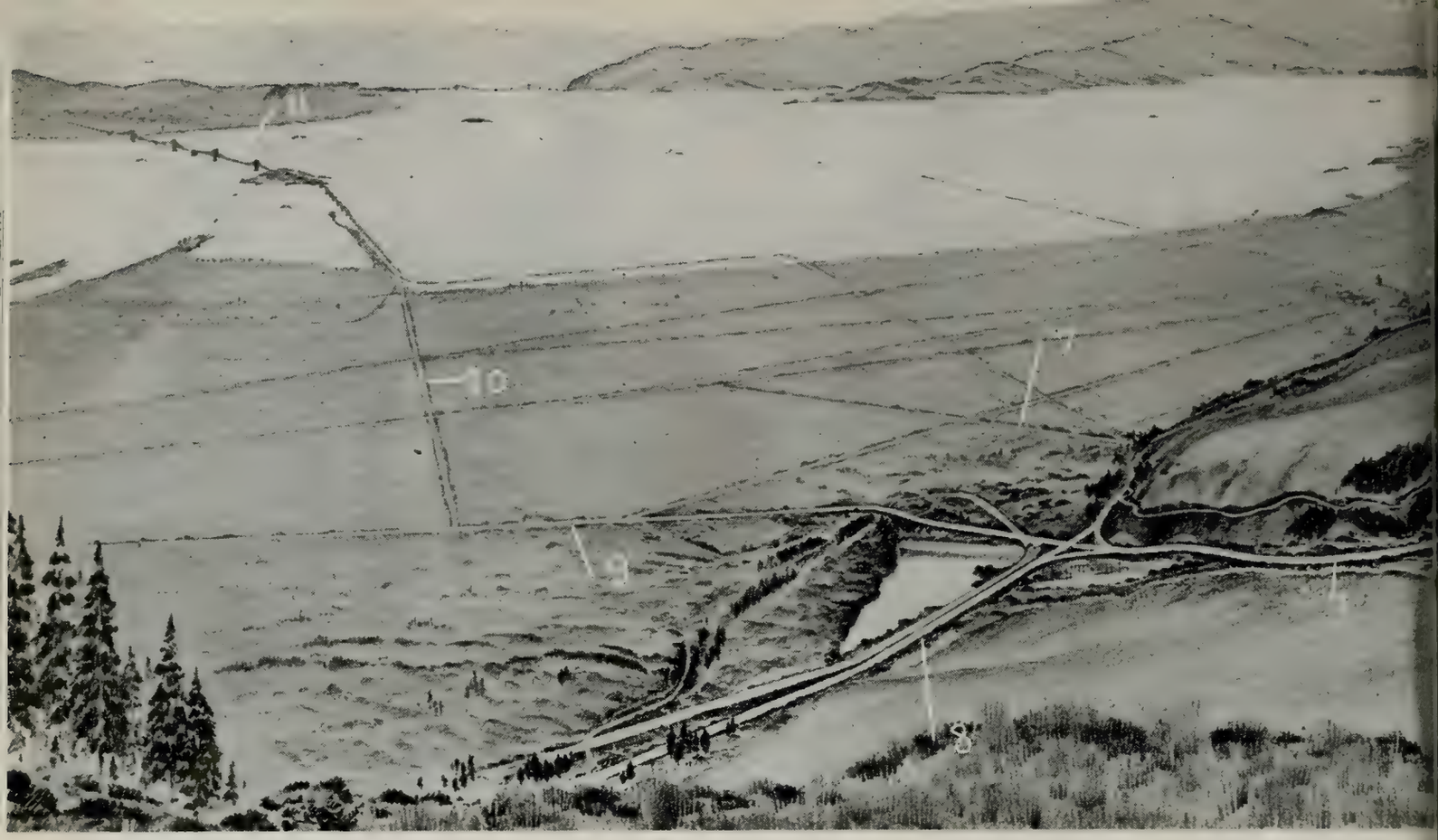
ON THE Roosevelt Highway in Monterey County ten bridges are being built. At Anderson Canyon, Buck Creek and Lime Creek, respectively, 45, 47 and 49 miles south of Monterey, timber bridges, having a 24-foot roadway, are under construction, under the supervision of the Bridge Department.

Another bridge is being laid across Willow Creek, 32 miles north of San Simeon, a timber bridge having a 24-foot roadway.

Across Hot Springs Creek, 47 miles south of Monterey, a timber bridge having a 24-foot roadway is under way.

Dolan Creek, 49 miles south of Monterey, is being spanned by a timber bridge with a 24-foot roadway.

On a four-mile stretch of the highway between 75 and 79 miles north of San Luis Obispo four bridges are needed. At Prewitt Creek, a timber bridge is under construction; at Wild Cattle Creek, a steel and timber bridge; at Mill Creek, a steel bridge and at Kirk Creek, a timber bridge. All of these structures have a 24-foot roadway and are under construction.



1—New tunnel road. 2—West portal of new tunnel. 3—East portal. 4—Old tunnel road. 5—Line of old tunnel.
land. 11—San Francisco-Oakland

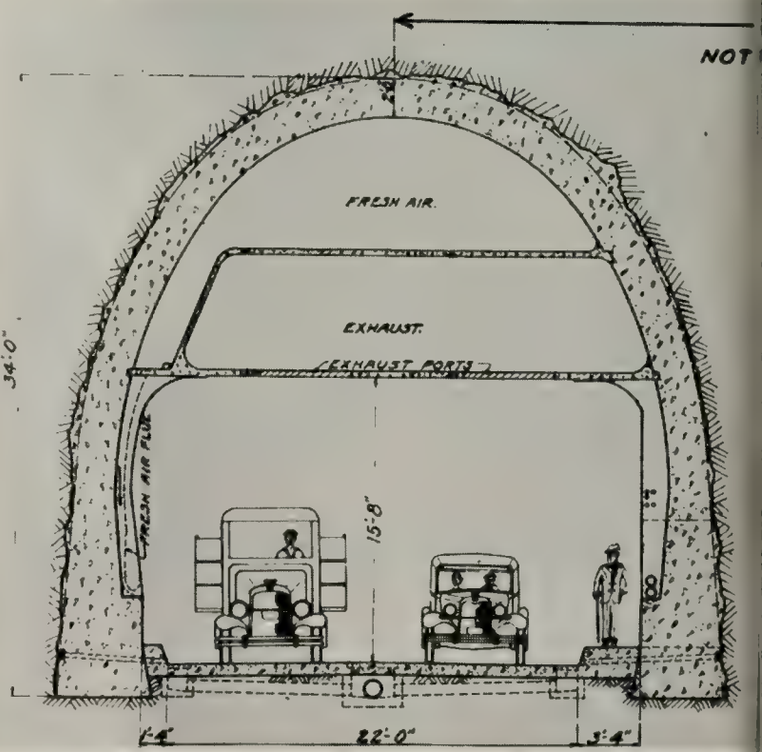
Broadway Low Level Tunnel Project Be

By **WALLACE B. BOGGS,** District Engineer, Joint Highway District No. 13

THE BROADWAY low-level tunnel project of Joint Highway District No. 13 is planned to provide a modern highway route from Oakland, Berkeley and other East Bay cities into the Contra Costa County suburban area east of the Berkeley Hills. Ultimately it will be a part of an Oakland-Stockton highway, which will result in a saving of about 10 miles in distance as compared with the present route through Dublin Canyon, Livermore and Tracy.

The project had its inception in 1926, when public demand, aroused by the inadequacy of the existing Tunnel Road and Fish Ranch Road routes, resulted in the preparation of a preliminary report on possible tunnel locations through the Berkeley Hills between Alameda County and Contra Costa County. This report was prepared upon the authorization of the counties of Alameda and Contra Costa, and the city of Oakland, acting jointly.

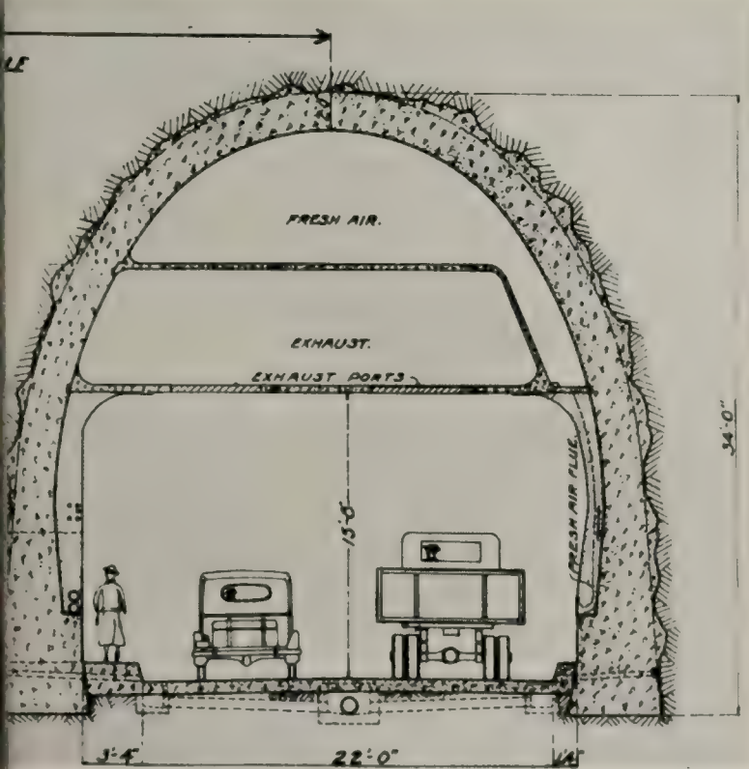
Following the submission of the report, a joint highway district consisting of Alameda and Contra Costa counties was formed to perform the preliminary work, including a survey for a relocation of the highway between Oakland and Walnut Creek.



The main part of the project is 2.82 miles in length, c
way and Keith Avenue in Oakland, up Temescal Canyon
long emerging north of the Fish Ranch Road in Cont
the present Tunnel Road about 1500 feet north of the F
each bore accommodating two one-way lanes on a
the Oakland-Stockton highway providing direct access t
of the Berkeley Hills extending into the San Joaquin and

e of new tunnel. 7—City of Berkeley. 8—Lake Temescal. 9—Broadway, Oakland. 10—Fortieth Street, Oak-
ridge. 12—Golden Gate Bridge.

en Alameda and Contra Costa Counties



g of a highway leading from the intersection of Broad-
to the Berkeley Hills, in a double bore tunnel 3168 feet
a County the highway extending to a connection with
ch Road. The tunnel will provide four traffic lanes,
roadway. Eventually this project will be a part of
n Francisco-Oakland Bay Bridge for that section east
ento valleys.

STATE COOPERATED

The California Highway Commission, at about the same time, made a preliminary reconnaissance of the proposed Oakland-Stockton route, and the report by the State highway engineers emphasized the importance of this road in providing an adequate and direct easterly outlet from the East Bay cities, and in opening up the suburban areas in Contra Costa County to development.

Action of the State Legislature resulted in the taking into the State highway system of the existing Tunnel Road in Contra Costa County. An agreement for financial aid by the State in the construction of a new tunnel and highway approaches to be built by Joint Highway District No. 13, consisting of Alameda and Contra Costa counties, came as a result of cooperation between the Director of Public Works of the State of California, the California Highway Commission and the officers of Joint Highway District No. 13.

Traffic studies made by the Division of Highways showed a weekly traffic over the present narrow and hazardous route of 30,000 vehicles in 1930, and indicated a probable traffic of 77,000 vehicles weekly in 1940. The completion of the San Francisco-Oakland Bay Bridge in 1937 will probably cause this esti-

(Continued on page 19)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.
Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ---------- Director
JOHN W. HOWE ---------- Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 MAY, 1934 No. 5

An Editor's Tribute

Gorgeous mountain scenery meets the eye in mile after mile of the new highway that opens up the San Jacinto Mountains in the Idyllwild region. The scenes are both fearful and wonderful. This road adds something distinctive to the ever-unfolding panorama of California scenery. * * I made this journey, entering from Hemet into the Idyllwild area, turning within three miles of that mountain resort, at about the 5000-foot level, and drove through the magnificent country to the point where the road emerges between Palm Springs and Indio.

On every hand is the gigantic upthrust of volcanic rock, bare, forbidding, but beautiful, with scarcely a tuft of vegetation anywhere. The rocks rise in curious cones and mounds, and in indescribable shapes, all colors of the spectrum, it would seem.

This drive adds another to the many pathways to beauty which the State has provided, and brings the thought that California is growing every year in accessible areas, broadening the opportunities for the tourist as well as the old-timers like ourselves, who have been here since the sage and cactus days. Every year sees the inclusion of some hitherto inaccessible portion of the State, linking eternal snows, volcanoes, flowers, fruits and waving fields of grain in a panorama that can not be anything but delightful to the visitor.

California, land of fruits and flowers, is also California of the deepest snows, the most intense cold, the deepest valleys, the highest mountains—and all these are being made approachable to everyone through the gradual widening and broadening of the magnificent California State Highway System.—*J. L. Matthews, Editor Covina Argus, in Indio Date Palm.*

New California Road Map is Published by Division of Highways

THE DIVISION of Highways announces that the 1934 edition of the California road map has been published by Earl Lee Kelly, Director of the Department of Public Works. This new map has been prepared under the direction of C. H. Purcell, State Highway Engineer.

The map conforms to standards adopted by the Western Association of State Highway Officials. These standards for the preparation of State road maps control the size of the map, the colors, style of lettering and legends used, so that road maps published by all States which are members of the association are uniform in character.

The size of the map is 28 by 34 inches. It shows the entire State as a unit and is printed in four colors. The roads shown include the primary and secondary routes of the State highway system and the principal county roads. Three different widths have been used in delineating the roads according to their classification as Federal Aid routes, United States highways, State roads or county roads.

All principal towns and cities are shown and the mileage between points is clearly indicated. The type of road surfacing is shown by color, red indicating a high type of improvement, yellow an intermediate type and black a low type.

One of the features of the map which makes it particularly valuable for touring purposes are the notations indicating the United States highways by number.

Printed on the reverse side are large scale maps of the chief metropolitan areas in California, showing the principal arterials and through streets. These local maps show areas in the vicinity of Los Angeles, San Francisco Bay, San Diego, San Jose, San Bernardino, Sacramento, Stockton, Fresno and Bakersfield. There is also a small scale map of the eleven Western States with the United States numbered highways shown thereon.

Copies of this latest California road map may be secured from the Division of Documents, State Capitol Building, Sacramento, at a cost of thirty-five cents.

Lady: "So your married life was very unhappy? What was the trouble? December wedded to May?"
Liza Johnson: "Land sakes no, ma'am, it was Labor Day wedded to de day of rest."—*Fireman's Fund Record.*

Two Parallel Bores to Carry Traffic

(Continued from page 17)

mate for 1940 to be considerably exceeded by affording a short cut from the Stockton area.

STANDARD FOUR-LANE HIGHWAY

The determination of standards for the new route was made after cooperative studies by engineers of the joint highway district and the engineering staff of the State Division of Highways. Fundamentally, these standards provide for a four-lane highway, with adequate shoulder areas, a maximum gradient of 5.1 per cent, and a minimum radius of curvature of 800 feet; the elimination of grade crossings with railroads and other main highways was also determined upon. California highway design standards for structures were made a minimum requirement.

Location surveys were made by the district and the detailed design of structures carried on during 1932. All rights of way were acquired by the district during that time. Plans and specifications for the project were completed in March, 1933, and received the approval of the Director of Public Works.

The main part of the project is 2.82 miles in length, consisting of a highway leading from the intersection of Broadway and Keith Avenue, in Oakland, northeasterly up Temescal canyon and through a double bore tunnel 3168 feet in length on the center line, emerging north of the Fish Ranch Road in Contra Costa County, the highway extending to a connection with the present Tunnel Road about 1500 feet north of the Fish Ranch Road; there is also an additional unit of 0.91 mile of highway connecting the new road with the Tunnel Road leading to Berkeley, and with Landvale Road in Oakland.

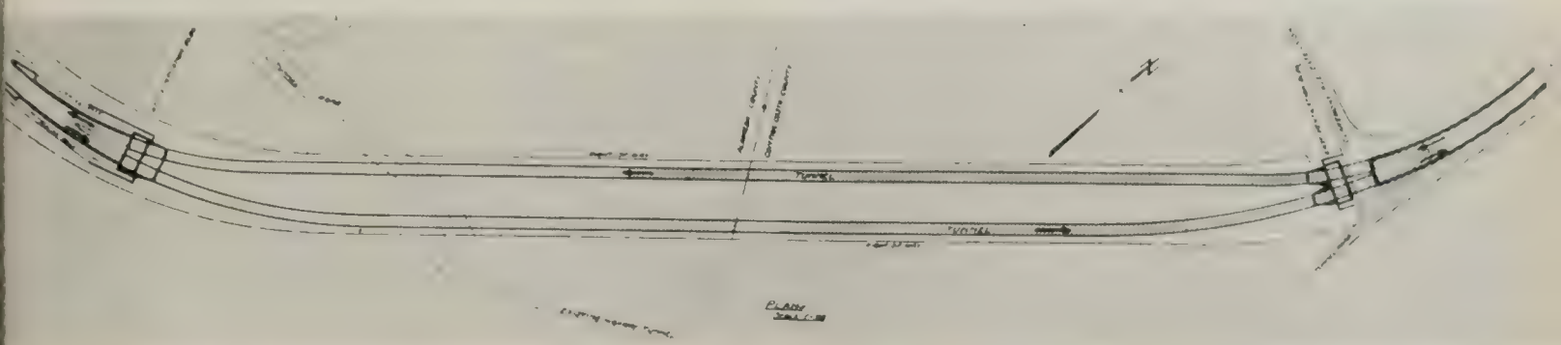
TWO IMPORTANT CONNECTIONS

This latter unit provides an East Oakland connection and also a new through route from Berkeley to East Oakland and to Southern Alameda County, which will eliminate the necessity of using heavy traffic streets and will effect a saving of about a mile between points in East Oakland and the University of California campus and business sections of Berkeley.

This East Oakland-Berkeley highway crosses the main Tunnel Highway on an overhead structure. The Fish Ranch Road is also carried on an overhead structure over the east portal of the tunnels to connect with the existing Tunnel Road.

The tunnel will consist of two parallel bores, each having a 22-foot roadway and a 3-foot sidewalk. The tunnels are 15 feet apart at the portals, but are separated by 100 feet through the main portions. Three cross-connections for pedestrian use are provided between the two bores. The tunnels will be concrete lined throughout, and mechanically ventilated to keep carbon monoxide pollution within safe limits.

The fans, which are installed in reinforced concrete buildings at each portal, have an input capacity of 1,500,000 cubic feet of fresh air per minute, and will exhaust a similar amount of air, when operated at maximum speeds. Carbon monoxide recorders and detectors will indicate the degree of pollution at all times and serve as a guide to the operation of the fans. Electric illumination and traffic control devices are provided.



The tunnel will consist of two parallel bores, each having a 22-foot roadway and 3-foot sidewalk. The bores 5 feet apart at the portals but separated by 100 feet through the main portions with cross connections for pedestr and ventilation provided by huge fans installed in concrete buildings at each portal.

(Continued on page 31)

Ground Broken for Monte Rio Bridge Over Russian River to Cost $100,000

HIGHWAY COMMISSIONER TIMOTHY A. REARDON, officially representing Governor James Rolph, Jr., turned the first shovelful of earth with a golden shovel, when ground was broken for the $100,000 Russian River Bridge at Monte Rio Sunday, April 29th.

Hundreds of residents of the Redwood Empire, including State, county and city officials, and chamber of commerce leaders, attended the ceremonies, jointly sponsored by the Redwood Empire Association and the Monte Rio Chamber of Commerce at Alberts Grove.

W. C. Healy, president of the Monte Rio Chamber of Commerce, was chairman of the day.

Commissioner Reardon, in turning the first earth for the new highway unit, which is being constructed by Joint Highway District No. 19, read a message from Governor Rolph. "The beginning of construction upon this magnificent steel and reinforced concrete bridge, to cost nearly $100,000 is indeed cause for rejoicing throughout the entire Russian River district, as well as among thousands of visitors who share the delights of your recreational wonderland," the message read in part.

PAGEANT OF TRANSPORTATION

One of the features of the celebration was the pageant of transportation presented by six Monte Rio girls, pupils of the Analy High School at Sebastopol. They were Dorothy Collier, Ione Bowers, Geraldine Collier, Margaret Hess, Nellie Guidotti and Margaret Lewis. Garbed in colorful costumes the girls showed progress in transportation across the Russian River from the days of the pioneers to the present time.

Supervisor Willard C. Cole, in whose district the new project is being carried out, was the first speaker on the program. He gave a short talk giving in brief a history of Joint Highway District No. 19, of which he is a member.

Ed. Enzenauer, chairman of the board of supervisors, welcomed the visitors and congratulated members of the highway district for their work in making possible start of the bridge.

PRESIDENT GOLDMAN HEARD

M. Goldman, president of the Redwood Empire Association, delivered an address describing the association's activities and particularly thanked Commissioner Reardon for his support of the $40,000 appropriation for the bridge from joint State highway district funds.

Senator Herbert W. Slater spoke and introduced Senora Luisa Vallejo Emparan, daughter of General Mariano Guadelupe Vallejo. Senora Emparan sang two Spanish songs and made a short speech of appreciation for the new highway unit, contrasting modes of travel today with those of the days of her father.

Other speakers were George H. Harlan of the Golden Gate Bridge and Highway District; J. B. Piatt, district engineer, who designed and is supervising construction of the bridge; Assemblyman Hubert B. Scudder and Deputy Director of Public Works Morgan Keaton, representing Director Earl Lee Kelly.

DEPUTY DIRECTOR KEATON SPEAKS

Keaton's was one of the principal addresses of the day. He congratulated the Russian River area on its new highway development and predicted a great increase in tourist traffic as a result of the new span.

Frank P. Doyle, Supervisors James McSheehy and John Ratto of San Francisco, and L. V. Campbell of the State Division of Highways were introduced during the program.

Music throughout the ceremony was furnished by the Analy High School Band.

The new bridge, which will be of steel and concrete, will be 770 feet in length, replacing the present antiquated 871-foot bridge and eliminating a traffic congestion at a T intersection.

STATE GIVES $40,000

The existing bridge was built in 1913 and is considered obsolete now. It has been too narrow to accommodate traffic for many years and has become extremely dangerous for

BEGINNING A BRIDGE. Officials in this picture of ground breaking ceremony at Monte Rio are, left to right: President W. C. Healy, Monte Rio Chamber of Commerce; Assemblyman Hubert Scudder; President M. Goldman, Redwood Empire Association; State Highway Commissioner Timothy A. Reardon with the golden shovel; Senator Herbert Slater; Morgan Keaton, Deputy Director State Department of Public Works, and Chairman Ed. Enzenauer, Sonoma County Board of Supervisors, together with "Pageant of Transportation" girls.

pedestrians owing to the fact that it has no sidewalks. The roadway of the new bridge will be 20 feet between curbs with a five-foot sidewalk on either side. It will have a concrete decking sidewalks and railing.

The project is being financed and constructed under the Joint Highway District Act of 1931. The State of California has appropriated $40,000 towards the project while Sonoma County will pay $64,750 out of its gas tax money of 1933 to 1935, inclusive. Mendocino County will pay $250 to make up the balance. Officials of Joint Highway District No. 19 are Supervisors T. J. Ferguson, president; W. C. Cole, C. R. Perkins, Geo. P. Sanborn and James W. Ramage, treasurer.

TURKS STRONG FOR PERMITS

It must take patience to travel in far-off Turkey. The Automobile Club of Southern California notes a report that in order to go from one town to another a traveler must obtain a permit from the mayor and chief of police on which is attached the petitioner's photograph. Anyone going by bus must wait until the driver has a full load. The only other alternative is to pay for the entire bus, it is said.

Safety Congress to Draft Uniform Code

SECRETARY Roper of the Department of Commerce has called a meeting of the National Conference on State and Highway Safety in Washington on May 23–25. Among the recommendations to be offered for adoption is a consolidated manual on traffic signs, signals and markings.

In a statement Secretary Roper said: "Before the ultimate in traffic safety is achieved we must have national uniformity in traffic laws and ordinances. We must have uniform signs and signals and uniform driving practices. * * * The various States and cities must work collectively as well as individually if this uniformity is to be obtained."

Public Safety magazine, in referring to the meeting, says: "It is to be hoped that the conference will urge the adoption of a unified policy in the placement of centralized controlment of road signs, markings and signals in the hands of the State departments."

Quarter-Cent Funds Bring CWA Aid

(Continued from page 11)

By following that plan, there will be a definite improvement to show for the expenditure of the money at the end of the biennium.

276 CITIES PARTICIPATING

There are 276 incorporated municipalities in California that are participating in the distribution of the quarter-cent gas tax allocation. Of this number, State highways pass into or through 248 cities. There are 28 cities where there are no State highway routes within their limits.

There are a total of 989 miles of State highway within incorporated municipalities, and of this amount, 129 miles were being maintained at State expense before the act took effect. The remainder, or 860 miles, represent the additional mileage of State highway within cities, as a result of recent legislation.

At the time the civil works program was undertaken last winter by the Federal government, with a view of providing employment for idle labor, the proportion of the Federal funds allotted to a project which could be used for the cost of administration, rental of equipment, and purchase of materials was limited to such an extent that there was little more than sufficient money to pay the cost of supervision, transportation for the men, and incidental equipment and supplies, so that the work had to be practically hand labor work, with no funds available to purchase materials.

Many of the cities were quick to grasp the possibility of using quarter-cent funds to purchase materials for use with CWA labor. By this means it was possible to undertake many worthwhile projects requiring a considerable proportion of the expenditure for materials and equipment, which could not have been undertaken with CWA labor alone.

This plan of combining quarter-cent funds with CWA labor has materially increased the effectiveness of the CWA labor and has resulted in the accomplishment of worth while improvements, of which all parties concerned—the Federal government, the cities, and the State—can well be proud.

It is probably too soon to draw any definite conclusions of the result of the quarter-cent allocation, since it only went into effect August 21, 1933, less than a year ago. The expenditure of the money, however, is resulting in a direct benefit to the motorist, who contributes the tax. In numerous cases, State highway routes within cities are being maintained to a standard heretofore impossible due to the very limited finances of the community; chuck holes are being filled, bumps are being removed; and washboard effects are being eliminated; streets are being paved, resurfaced, and widened; existing shoulders are being oiled, and routes are being marked so that the motorist may pass through a city comfortably and easily.

APPIAN WAY COULD BE BUILT TODAY FOR ONE-TENTH OF COST

"In attempting to obtain a proper and logical perspective on the question of hand labor versus the machine in highway building, we might look at that most famous of highways, the Appian Way, built by Caesar's armies. It is estimated that construction of that road today, using the same methods, would result in a cost of $300,000 a mile. That naturally includes the primitive method of preparing and transporting the materials as well as their actual placement.

"We can build roads as wide, adapted to the demands of much heavier and faster traffic, and a lot smoother, today at a cost of less than one-tenth of that sum. This, too, in spite of the fact that labor is by no means so inexpensive as in Caesar's time."—*A. H. Hinkle, Supt. of Maintenance, Indiana Highway Comm.*

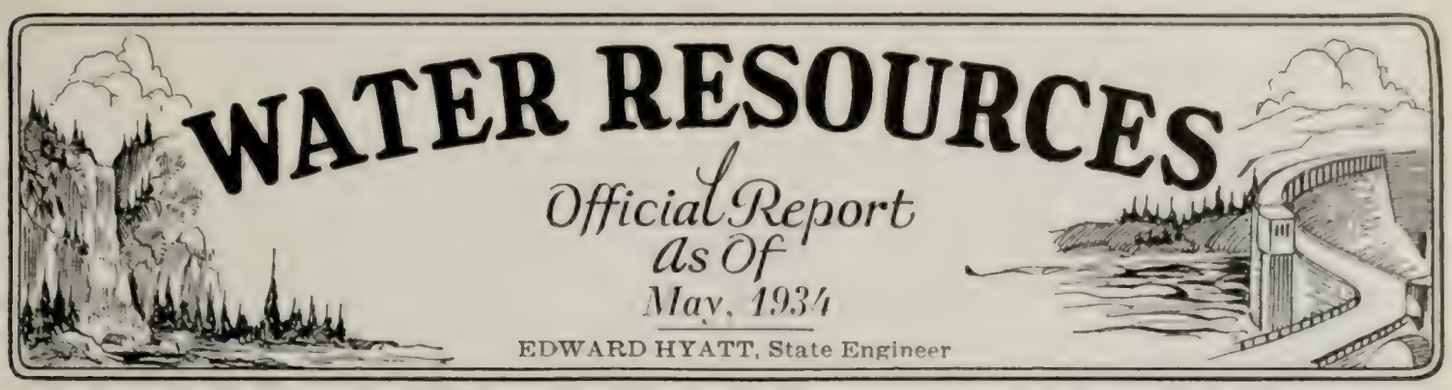
INCREASE IN TOURIST TRAVEL TO CALIFORNIA FORECASTED

All indications point to a tremendous revival of motor touring within and to California this year. The Automobile Club of Southern California touring bureau recorded a gain of more than 537 per cent in written inquiries received during March of this year over the same period last year. March correspondence totaled 5331 as against 993 during March, 1933.

Total number of inquiries answered by the club's touring bureau during the first three months of this year was 9543 as compared to 2247 over the same period of 1933, a gain of more than 425 per cent.

Pat was one day employed by an old lady in the country. At dinner she placed a very small portion of honey on his plate.

"Begorrah, ma'am," said Pat, "I see you keep a bee."—*Fireman's Fund Record.*



A hearing on the Central Valley Water Project was held before the Board of Engineers on Rivers and Harbors March 27, 1934, in Washington, D. C., and the report of the Chief of Engineers pursuant thereto was rendered under date of April 6, 1934, and forwarded to the Rivers and Harbors Committee. The report of General Markham, Chief of Engineers, in approving the project recommended Federal participation of $12,000,000 for the construction of Kennett Dam to the height proposed by the State.

This report was approved by the Rivers and Harbors Committee on April 13, 1934, by resolution unanimously adopted by the members present. At the hearing which preceded the introduction of the resolution the report and the Central Valley Water Project were explained and endorsed by General Markham, Chief of Engineers, U. S. Army. Following are quotations from General Markham's address:

PROJECT HIGHLY PRAISED

"This is as well devised an engineering project as has come to my attention anywhere * * * ever."

"In this majestic project of the State of California we have no shadow of a doubt of the Federal interest * * * perhaps to a degree in excess of the appropriation recommended. The $12,000,000 estimate is conservative."

The application for a grant and loan for the construction of the project has been referred by the Engineering Department of the PWA to the Federal Power Commission for intensive study of the hydroelectric power features of the project. Application for a license has also been filed with the Federal Power Commission by the executive officer of the Central Valley Project Authority. These matters are being followed as vigorously as possible so that early action may be had on the project.

IRRIGATION DISTRICTS

Information from all parts of the State indicates that nearly all districts which depend for irrigation upon the direct diversion of natural flow from streams will be short of water for the 1934 season and, with few exceptions, storage will also be short.

Districts Securities Commission.

Request was received from the recently organized South Fork Irrigation District, Modoc County, for consent of the Commission to the calling of an election on a $160,000 bond issue to be used in support of an application to PWA for funds to construct a storage dam.

FLOOD CONTROL AND RECLAMATION

Sacramento Flood Control Project—Bank Protection.

Work under the State-Federal cooperative program for permanent bank protection has continued under the U. S. Engineer Office at Sacramento, in Reclamation District No. 108 and Reclamation District No. 1500.

At the request of the Reclamation Board, work was commenced on April 16th installing an irrigation pipe through the levee of Reclamation District No. 2047 on the property of W. D. De Jarnett, to cost $1,000.

Mokelumne River.

On March 29, 1934, work under CWA projects No. SJ-50-X, San Joaquin County, and No. Sac-1003-X, Sacramento County, was discontinued upon termination of the program. Valuable work was performed under these projects and it is hoped that it may be continued under the SERA program, particularly in Sacramento County, to clear the by-pass between Reclamation District No. 1002 and the McCormack-Williamson tract.

Flood Measurements and Gages.

During this period no work other than routine maintenance of stations and gages was performed, with the exception of the installation of two automatic recorders in Butte Slough and Butte Creek.

WATER RIGHTS

Supervision of Appropriation of Water.

Thirty-two applications to appropriate water were received during the month of March; 12 applications

(Continued on page 29)

Ventura Overhead Grade Separation Will Eliminate Dangerous Underpass

By **F. M. BARNES,** Associate Designing Engineer of Bridges

CONSTRUCTION of the Ventura overhead structure separating the grades of the main line of the Southern Pacific Company and the Coast Route of the State highway is now well under way and is expected to be completed this fall. This grade separation, located about three miles north of the city of Ventura and consisting of a steel and concrete structure carrying the highway at an elevated grade over the railroad tracks, is a part of a major project for reconstruction and improvement of the State highway from Ventura northerly to Santa Barbara County.

This highway, known as State Highway Route 2 and as U. S. Highway Route 101, follows in general the alignment of the El Camino Real between San Diego and San Francisco, and in this particular section parallels the beautiful coast line of Santa Barbara and Ventura counties.

INVOLVES NEW SEAWALL

The improvement of the highway was made necessary by the unsatisfactory condition of the present road, its alignment being poor in certain portions and its traffic capacity exceeded throughout. The project as a whole extends for about 12 miles north of the city of Ventura and involves partial major realignment, widening of the Ventura River Bridge, now completed, construction of the Ventura overhead, widening of pavement and shoulders, and the building of approximately one and one-tenth miles of seawall in addition to that now existing. The present seawall, which is to remain in service, was constructed in 1925.

The construction of the Ventura overhead was made imperative both by reason of the realignment of the highway and the dangerous driving conditions presented by the existing underpass, about eight-tenths of a mile south of the new structure. This underpass has outlived its period of usefulness because of its sharp approach curves, dangerously short visibility and narrow width between walls—conditions not in keeping with standards of highway design made necessary by present day speed of travel.

Reconstruction of the existing underpass at approximately its present location would have involved expensive seawall construction and detours which are avoided by the new alignment.

The Ventura overhead structure, a separate contract, is to consist of 13 reinforced concrete girder spans for its approaches and a specially designed steel girder span over the track, the latter being coated with concrete, applied by means of a cement gun, to combat the salt air and to reduce maintenance costs. The piers are to be of reinforced concrete, founded on stiff clay and compacted sand, in which no piling is required.

HIGH AS THREE-STORY BUILDING

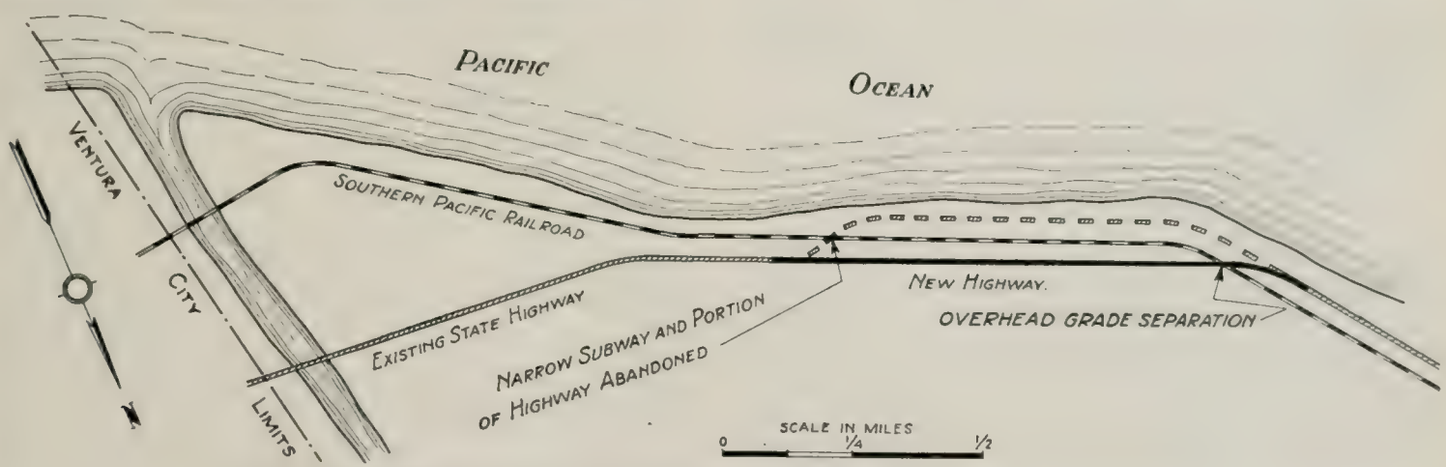
The elevation of the roadway above the foundations at the ends of the structure, rising to the height of a 3-story building, where the supporting columns will be buried in the roadway fills, required the design of special columns and heavy eccentric footings to prevent movement of the ends of the bridge under the action of the unbalanced loads of the fill. The footings for each column will cover an area of 114 square feet, there being a total of three columns in each pier.

The roadway deck is to be of reinforced concrete with railings of the same material, which are at the same time both ornamental and sturdy. Paving of approaches is being done to three-lane width, with wide shoulders, in consequence of which the overhead structure is being constructed with 40-foot roadway and with two $3\frac{1}{2}$-foot sidewalks to afford the same safety and freedom from mental hazard for drivers and pedestrians when crossing the overhead as when traveling on the balance of the roadway.

The overall length of the structure, not including long earth fill approaches on each end, is 570 feet, or over one-tenth of a mile. Construction will involve the use of over 3000 cubic yards of Portland cement concrete, 260 tons of reinforcing steel and 63 tons of structural steel, in addition to cast

(Continued on page 26)

OBSOLETE UNDERPASS, of narrow width and poor visibility that will be eliminated by realignment of the Coast Route north of Ventura.



SKETCH MAP showing realignment for Coast Route improvement.

VENTURA OVERHEAD in course of construction. It will separate grades of railroad and highway.

Overhead Structure to Cost $83,975

(Continued from page 24)

steel, excavation, temporary road surfacing, gunite, etc.

DIFFICULT TRAFFIC PROBLEM

The design and construction were both made more difficult by the very flat angle at which the center lines of the railroad and the highway intersect, as well as by the necessity of maintaining railroad traffic over the existing tracks and highway traffic under the northerly end of the structure at all times during construction. These conditions involved the design of a special type of pier at nearly every point of support, these piers ranging from ones requiring heavy cap beams cantilevering far beyond the last column to ones with long span cap beams and supporting columns considerably outside the limits of the bridge roadway.

The maintenance of highway traffic under the structure necessitates the construction of certain columns up to ground line while traffic is deflected to one side, then backfilling and placing temporary pavement over these column stubs while the opposite columns are constructed, then returning traffic to the original straight alignment and completing the construction of the first columns. Heavy long span formwork is also required over the existing roadway as no supports are being allowed to encroach on the present roadway area.

COLLISION WALLS PROVIDED

Collision walls are to be constructed between columns paralleling the tracks to guard against damage from accidentally projecting loads of girders, poles and similar objects being transported on freight cars.

It was planned to use long retaining walls at each end of the structure in lieu of abutments, the earth fill being allowed to take its natural slope between the end columns. The southerly wall will retain the fill from encroaching on the railroad roadbed, and the northerly wall was to have served the same purpose with respect to the existing road. It was found after construction started that by raising the grade of the existing roadway and by a slight shift of alignment that this northerly retaining wall could be omitted, which is being done at an appreciable reduction of total cost.

The highway alignment at the crossing is on a long radius curve, which involved superelevation of the bridge roadway. Grades over the structure are easy and there will be ample visibility.

When the structure is completed, the present highway will be left open and will have a full two-lane traffic width for the use of those desiring access to the beach for picnicking and bathing. The span over the railroad track will be sufficiently long and high to allow for a future second track with full clearance for trains.

UNDERPASS ELIMINATED

The present underpass will be closed to traffic in order that the hazard at this point will no longer exist, the connection between the new highway and the old road being by means of earth fill ramps adjacent to the structure.

Provision has been made for widening the structure at a future date when traffic requirements so dictate, but it is expected that widening will not become necessary for many years, at which time it can be done at a net saving to the State over the cost of present construction to a greater width.

This project is financed through the National Industrial Recovery Act and this secures for the State a much needed improvement as well as considerable relief to unemployment in this vicinity. No workman on the job, with the exception of those in supervisory capacities, is working more than thirty hours a week as provided by the Federal act.

The contract for the construction of the overhead was awarded on January 26, 1934, at a total bid price of $83,975, and the time limit for construction was fixed at 175 working days. It is now expected that construction will be complete on or before September 1, 1934, the date upon which the time limit expires. It is expected that the adjacent section of about eight and one-half miles of new highway will be opened to traffic about January, 1935.

A little girl was explaining to her younger brother that it was wrong to work on Sunday.

"Well, policemen work on Sundays," said the boy. "Don't they go to heaven?"

"No," she replied; "they don't need policemen up there."—*Boston Transcript.*

Director Delegates to Cities Police Power on Through Highways

(Continued from page 9)

A. Yes. The improvement by the State from State highway funds of portions of State highway within city limits, where the natural course of a State highway or State highway system runs or passes into or through any municipality or contiguous municipalities, is authorized by law. Furthermore, the 1933 Legislature included many miles of city streets in the secondary State highway system.

Q. What system has been evolved to avoid possible conflict between the State and the cities in the administration and allocation of the one-quarter cent gas tax in incorporated cities?

A. A system is followed similar to that employed by the Federal government in its dealings with the State on Federal aid highway work. A city submits a project statement proposing the improvement to be made. If approved by the State Director of Public Works, a formal project agreement is then entered into between the State and the city wherein the work to be done is described, the maintenance provided for, the funds specified, and the delegation of jurisdiction to the city prescribed.

Q. What is meant by the delegation of jurisdiction?

A. The 1933 Legislature authorized the Director of Public Works to delegate to such municipality all or any part of the powers and jurisdiction vested by law in him or the State Department of Public Works over and in respect to all or any section of any such State highway within such municipality.

Q. Why is such delegation of jurisdiction desirable?

A. It enables the State to delegate to the cities certain police powers to regulate traffic, parking, encroachments, permits, et cetera, which are considered to be local in character and convenience, over streets constituting State highway routes.

Q. Can the Director of Public Works delegate to any such municipality the expenditure by the municipality, directly, of its share of the one-quarter cent gas tax?

A. Yes. When and if the Director of Public Works is satisfied that such city is equipped to conduct the proposed work in an efficient and economic manner.

Q. How many cities of California participate in the distribution of the one-quarter cent gas tax?

A. Two hundred seventy-six cities.

"Have any big men ever been born in this town?"
"No, only babies."

Principles Laid Down for Improvement of Highway Roadsides

ROADSIDE improvement does not consist merely in planting shrubs, trees and grass, but to a considerable degree it depends on how intelligently and carefully the road builders preserve and make the best use of what is already growing there, Wilbur H. Simonson, landscape architect of the Bureau of Public Roads, U. S. Department of Agriculture, said in a recent talk before the American Association of Landscape Architects meeting in Washington:

"The first step in the salvaging of existing plant growth is taken when the highway engineer and landscape architect are brought into agreement on the location of the highway and the utilization of its right of way," Mr. Simonson declared. "Thus, the foundation for landscape improvement is laid before the construction of the highway begins rather than after the road surface is completed.

SAVING THE TREES

"Trees and undergrowth that are to be left undisturbed must be indicated before any cutting or planting is undertaken," said Mr. Simonson. "For example, where the highway passes through trees, proper cutting and saving will produce the effect of bringing the woods out to the road rather than stopping at the right of way fences, as often seems to be the case.

"Proper grading should aim to harmonize the cut and fill banks with the surrounding scenery. These construction scars in the landscape should appear to flow into the existing contours of the ground adjacent to the right of way with as little break in curvature as possible.

"Side ditches, in some instances, can meander to avoid existing trees or to follow the curve of a hillside. Ditch banks may be rounded so as to be scarcely noticeable. When grading is done with such ideas in mind, the planting and sodding of slopes is easy."

The above suggestions of Mr. Simonson have long been the accepted practice of the California Division of Highways.

A friend who had just returned from a holiday in Cornwall tells me of a notice posted outside of a village church. It read: Saturday night a concert will be held, to be followed by a pastry supper. On Sunday the vicar will preach, and his subject will be "A Restless Night."

Hydraulicking 6,000,000 Cubic Yards

(Continued from page 3)

hairpin turns were required, the route was on the shady side of the hill through a heavy snow belt, and the formations encountered were structurally weak. It also crossed directly over the remaining mass of gold bearing gravel in Oregon Hill and could not have been maintained when mining is resumed.

The second routing had to pass through the slide on the north rim of the mine, several million cubic yards in extent, and the country offered little support for a location on either side unless a very deep summit were made. These obstacles were insurmountable by ordinary methods of road building.

The existence of a portion of the water system that supplied water for the mining operations led to a study of what could be accomplished in the way of removing the slide and cutting through the summit of Oregon Hill by the hydraulic mining method. Study of operating costs of many hydraulic mines of the early days led to the conclusion that a cut four hundred feet deep, involving the movement of some 15,000,000 cubic yards would be economical. Such a cut would cut two and a half miles from the distance and permit a direct ascent from each side.

SIX MILLION-YARD OPERATION

With the available water supply, however, an annual movement of more than 1,500,000 could not be assured. In the end the line on the north rim of the mine was selected, and ten years would be required to complete the cut. A plan involving removal of about 6,000,000 cubic yards was adopted, and a hydraulicking venture was started on a scale not heretofore used on highway work.

Fortunately for these plans, the La Grange Placer Mines, Ltd., owners of all of the Oregon Hill and Gulch area and the water system and mining equipment, were willing to lease at a nominal rental, and to grant rights to deposit spoil on their lands on either side of Oregon Hill.

The Sweepstakes water system, consisting of 12 miles of flume, ditch and 30-inch hydraulic pipe, collects and conducts water from the East and West Weaver Creek drainage areas. The run-off varies from a few second-feet in the summer to about 75 at the peak, but the capacity of the ditch and flume is about 55 second-feet.

RESERVOIR CONSTRUCTED

Normally, from December to May in seasons of average precipitation and deep snow pack on the peaks, periods of several weeks will yield 50 second-feet and an average of 30 or better may be expected for a five months' period. This, however, is insufficient to operate an 8-inch giant which, with a head of 550 feet, uses water at the rate of 60 cubic feet per second. To regulate the flow, a reservoir of about 600,000 cubic feet capacity was constructed. From this a main pipe line of 30 and 26 inches diameter was laid down a ridge to a point where 18-inch branches take off to the giants.

Two huge hydraulic giants that have served their time loosening and washing gold-bearing gravel to the sluices have been set up, one with an 8-inch nozzle and the other with a 7-inch nozzle, and have been playing intermittently at the base and over the surface of the slide since February 28.

It has been said that water, like fire, out of control, is one of mankind's deadliest enemies, but under control is one of man's most useful servants. Certainly water controlled and directed through one of these hydraulic giants accomplishes phenomenal results, whether in moving gold-bearing gravel to the sluices or opening a way through a hill for a modern highway.

TWO TONS PER SECOND

The 8-inch giant shown in the illustration is discharging 2400 miner's inches, or 60 cubic feet, of water per second. Approximately two tons of water leave the nozzle each second at a velocity of about 200 feet per second. In other words, every second of operation two tons of water strike the bank with a terrific impact and carry away large volumes of material. Much material has been cut and removed by this stream that would have had to be blasted to be removed by any earth-moving equipment.

Owing to the particularly abnormal season, with practically no snow pack on the mountain peaks, the supply of water is disappointing. The first 31 days of operation, with an average daily run of six and one-half hours, resulted in the removal of 162,000 cubic yards. This is at the rate of 800 cubic yards an hour

Oregon Mountain Job May Require Four Years to Complete

(Continued from preceding page)

or 5200 cubic yards per day. The material moved is equal to 10.7 per cent of the volume of water used.

In the language of hydraulic mining, the performance of water is called "duty" and is the number of cubic yards moved by one miner's inch in twenty-four hours. The duty of the water for the first month's operation is 8.5. The duty in the La Grange mine in its days of operation at times was as high as 7.5 which was considered exceptional.

LOW UNIT COSTS

The unit cost for the first month's operation is 4.6 cents per cubic yard. This cost includes about 40 per cent of nonrecurring expense which will eventually be distributed over a much larger volume of material. This brief period of operation indicates that unit costs for the job will be well under 3.5 cents per cubic yard.

During the first month the giant operated 26.4 per cent of the time. In a normal year a giant should be able to operate at least 75 per cent of the working season. With the loss of two operating months this year, it is anticipated that well over 1,000,000 cubic yards will be moved in 1935.

It is probable that operations will continue for four years since the connections on either end can not be financed nor constructed before the expiration of that period.

Some minor hydraulic work has been done on highways in Washington and Florida, and to a limited extent in removing slides and sand cuts in California. Water for all of these operations was pumped, and the discharge nozzle was not over 4 inches.

RECORD-BREAKING OPERATION

This is believed to be the largest hydraulic operation yet undertaken on highway work. Unusual problems call for unique solutions. When mountains get in the way of highways, they must be moved, and, taking the first month's operation as an index, some of the work of the Cretaceous age is about to be undone in the twinkling of an eye, as geologists reckon time, and traffic will flow through Oregon Hill on or near the bed made by a stream millions of years ago.

Inspections Started in 48 Counties on 219 Water Projects

(Continued from page 23)

were denied and 12 were approved. During the month 8 permits were revoked and 17 were passed to license.

During the current field season, which started on April 2d, inspections will be made of 219 projects for the purpose of determining the amount of water beneficially used with a view to the issuance of licenses confirming rights under permits. Projects to be inspected are distributed throughout 48 counties of the State.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Snow survey data as of April 1st show that the snow pack in the higher elevations was practically the same as that in 1931 on April 1st. At the lower elevations, however, there was much less snow than in 1931. The total seasonal precipitation to April 1st in the major Sacramento and San Joaquin drainages is somewhat better than in 1931. Whether the summer stream flow will be as low as that of 1931 or somewhat better will now be dependent to a great extent upon whether subsequent spring precipitation is below normal or normal. The present outlook for salinity in the Delta is for an encroachment very similar to that of 1924.

From a flow of about 18,000 second-feet during the latter part of March, the flow of Sacramento River at Sacramento increased to 36,000 second-feet for a short peak on April 2d. Subsequently the flow has diminished steadily to a flow on April 16th of 15,000 second-feet. The corresponding flow in the middle of April, 1931, was about 7000 second-feet.

Salinity sampling is being maintained at three points only and the results for tests of samples taken at these points on April 10, 1934, are shown in the following tabulation showing also a comparison with the corresponding salinity in 1933 and 1931.

Salinity—April 10th

Salinity in parts of chlorine per 100,000 parts of water

	1934	*1933*	*1931*
Bullshead	320	170	500
Collinsville	3	1	20
Antioch	4	4	9

DAMS

Routine maintenance inspections have been made in many of the foothill and low mountain districts and in the bay area during this period and considerable progress has been made in Lassen County in covering the dams in that territory.

In southern California work continues on the construction of the San Gabriel No. 1 dam and El Capitan dam. Orders authorizing the use of Bouquet Canyon and Pine Canyon dams pending issuance of certificates of approval have been issued and first water was turned into the Bouquet Canyon reservoir.

Highway Bids and Awards

FOR APRIL

ALPINE COUNTY—Between Centerville Bridge and Markleeville, about 6.5 miles to be graded and surfaced with bituminous treated crushed gravel or stone (road mix method) and a bridge to be constructed across East Carson River, one 40-foot steel stringer span and six 19-foot timber spans on concrete and timber bents. District X, Route 23, Section C. Morrison, Knudsen Co., Los Angeles, $209,787; Peninsula Paving Co., San Francisco, $200,268; Isbell Construction Co., Carson City, Nevada, $238,573; United Concrete Pipe Corporation, Los Angeles, $239,876. Contract awarded to Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland, $200,012.

HUMBOLDT COUNTY—Between Campbell Creek and Klamath River, treating with fuel oil. District I, Route 84, Sections A, B. Ransome Co., Emeryville, $7,533; C. F. Fredricksen & Sons, Lower Lake, $7,133. Contract awarded to Albert Helwig, Sebastopol, $5,161.

HUMBOLDT AND DEL NORTE COUNTIES—Constructing truck sheds at Orick, Klamath and Crescent City Maintenance Yards. District I, Route 1, Sections Hum-1-J, D. N.-1-A, C. Albert Siemer, San Anselmo, $12,979; Fred J. Mauer & Sons, Inc., Eureka, $11,067; Pacific Truck Service, Inc., San Jose, $11,350. Contract awarded to Theo. Johanns, San Francisco, $10,890.

KERN COUNTY—Maintenance station buildings at Homestead. District IX, Route 23, Section E. N. F. Barber, Los Angeles, $4,686; C. I. Sumner, Lone Pine, $4,961. Contract awarded to D. A. Loomis, Glendale, $4,672.

KINGS COUNTY—Between Hanford and easterly boundary about 7.5 miles to be graded and paved with asphaltic concrete. District VI, Route 10, Section A. Basich Brothers, Torrance, $171,193; Union Paving Co., San Francisco, $169,229; A. J. Raisch Co., San Jose, $181,193. Contract awarded to Southern California Roads Company, Los Angeles, $167,952.

LOS ANGELES COUNTY—Between West Channel Road and California Avenue, about 1 mile to be paved with asphalt concrete and Portland cement concrete. District VII, Route 60, Section B, S. Mca. Griffith Co., Los Angeles, $81,370; Sander Pearson, Santa Monica, $82,234; United Concrete Pipe Corp., Los Angeles, $86,738; Dimmitt & Taylor, Los Angeles, $84,418; P. J. Akmadzich, Los Angeles, $111,740. Contract awarded to Oswald Bros., Los Angeles, $75,930.

MONTEREY COUNTY—A timber bridge across Hot Springs Creek, 48 miles south of Monterey, one 76-foot truss span, one 57-foot truss span and fifteen 19-foot stringer spans on concrete pedestals. District V, Route 56, Section D. B. A. Howkins & Co., San Francisco, $41,353; Alfred H. Vogt Co., Inc., San Francisco, $41,875; Parish Bros., Hollywood, $45,505; E. T. Lesure, Oakland, $42,854; Rocca & Coletti, San Rafael, $43,648. Contract awarded to M. B. McGowan, Inc., San Francisco, $36,620.

MONTEREY COUNTY—Timber bridge across Dolan Creek 50 miles south of Monterey, consisting of one 180-foot arch span, nine 19-foot stringer spans and four 38-foot girder spans. District V, Route 56, Section D. Alfred H. Vogt Co., Inc., San Francisco, $76,872; M. B. McGowan, Inc., San Francisco, $88,466; Bodenhamer Const. Co., Oakland, $76,452. Contract awarded to Rocca & Caletti, San Rafael, $67,881.

NAPA COUNTY—Between Napa and easterly boundary about 28.5 miles to be treated with fuel oil. District IV, Route 6, Sections A, B, C. Granite Construction Co., Watsonville, $7,918; Ransome Co., Emeryville, $7,770; E. A. Forde, San Anselmo, $6,660; L. A. Brisco, Arroyo Grande, $6,808; Peninsula Paving Co., San Francisco, $6,475; Lee J. Immel, Berkeley, $6,327. Contract awarded to Basalt Rock Co., Inc., Napa, $5,476.

PLACER AND EL DORADO COUNTIES—Treating with road oil and fuel oil between Lincoln and Newcastle, Placerville and Cool, Kyburz and Fred's Place, 2 miles east of Fred's Place and Strawberry. District III, Routes 91, 93, 11, Sections A, A and B, and H. Contract awarded to C. F. Fredrickson & Sons, Lower Lake, $8,690.

SAN DIEGO COUNTY—Furnishing and applying heavy fuel oil, Descanso to Morettis, 28.2 miles. District XI, Route 78, Sections A, B, C. Pacific Tank Lines, Inc., Los Angeles, $9,306; R. E. Hazard Contracting Co., San Diego, $7,286; L. C. Pulley, C. W. Wood, Long Beach, $7,444; Gilmore Oil Co., Los Angeles, $6,395; Square Oil Co., Los Angeles, $6,296; Paulson & March, Inc., Los Angeles, $6,454; Morgan Bros., Huntington Park, $6,811. Contract awarded to Lamb's Transfer Co., Long Beach, $6,217.

SAN FRANCISCO COUNTY—Between Waterloo Street and Islais Creek Channel, about 0.3 mile in length to be paved with asphaltic concrete. District IV, Route 68, Section S. F. The Fay Improvement Company, San Francisco, $30,953; Pacific States Construction Co., San Francisco, $32,615; Chas. L. Harney, San Francisco, $32,265; Pacific Pavements Co., Ltd., San Francisco, $40,636; A. J. Raisch, San Francisco, $32,983. Contract awarded to Eaton & Smith, San Francisco, $30,555.

SAN FRANCISCO COUNTY—Sloat Boulevard between Great Highway and Nineteenth Avenue about 1.5 miles in length, to be widened and paved with Portland cement concrete and asphaltic concrete. District IV, Route 55, Section S. F. N. M. Ball and Jones & King, Berkeley, $109,088; A. J. Raisch, San Francisco, $106,534; The Fay Improvement Company, San Francisco, $105,566; Peninsula Paving Company, San Francisco, $115,642; Chas. L. Harney, San Francisco, $118,750. Contract awarded to Eaton & Smith, San Francisco, $104,602.

SAN FRANCISCO COUNTY—Between Bayshore Boulevard and Mission Street Viaduct, about 1.3 miles in length to be paved with asphaltic concrete. District IV, Route 2, Section S. F. Jones & King, Hayward, $62,341; Eaton & Smith, San Francisco, $60,516; Charles L. Harney, San Francisco, $61,844; Pacific Pavements Co., Ltd., $74,062; A. J. Raisch, San Francisco, $65,873; Pacific States Construction Co., San Francisco, $56,928. Contract awarded to The Fay Improvement Co., San Francisco, $56,325.

SAN FRANCISCO COUNTY—Bryant Street between 5th Street and 10th Street, about 0.7 mile in length to be widened and paved with Portland cement concrete and asphaltic concrete. District IV, Route 68, Section S. F. The Fay Improvement Company, San Francisco, $74,804; Chas. L. Harney, San Francisco, $87,599; MacDonald & Kahn Co., Ltd., San Francisco, $78,697; Eaton & Smith, San Francisco, $80,422. Contract awarded to A. J. Raisch, San Francisco, $69,461.

SAN FRANCISCO COUNTY—Between Van Ness Avenue and Division Street, about 0.9 mile in length to be paved with asphaltic concrete. District IV, Route 2, Section S. F. A. J. Raisch, San Francisco, $67,719; Charles L. Harney, San Francisco, $78,218; MacDonald & Kahn Co., Ltd., San Francisco, $76,392; Eaton and Smith, San Francisco, $69,631. Contract awarded to A. J. Raisch, San Francisco, $67,719.

SAN LUIS OBISPO COUNTY—In the city of Arroyo Grande, about 1036 lineal feet of Portland cement concrete curbs and gutters to be constructed. District V, Route 2, Section Ar. Gd. Theo. M. Maino, San Luis Obispo, $1,417; Walter B. Roselip, San Luis Obispo, $1,762. Contract awarded to John Fesler, Santa Maria, $1,215.

SHASTA COUNTY—Between Redding and Viola, 34.0 miles to be treated with fuel oil. District II, Route 20, Sections C, D, E. C. F. Fredricksen & Sons, Lower Lake, $15,715; Tiffany Construction Co., San Jose, $13,313; A. Teichert & Son, Inc., Sacramento, $16,016. Contract awarded to Tieslau Bros., Inc., Berkeley, $12,462.

SISKIYOU COUNTY—Between the southerly boundary of Yreka and 1½ miles north, about 2.4 miles to be graded and surfaced with crusher run base and asphaltic concrete. District II, Route 3, Section C, Yre. Hanrahan Company, San Francisco, $142,060; The United Contracting Co., Portland, $145,699. Contract awarded to Chas. L. Harney, San Francisco, $126,325.

SONOMA COUNTY—Furnish and apply light fuel oil to existing roadbed between Duncan Mills and Mendocino County line about 41.9 miles. District IV, Route 56-104, Sections C, D, E, A. Tieslau Brothers,

(Continued on page 32)

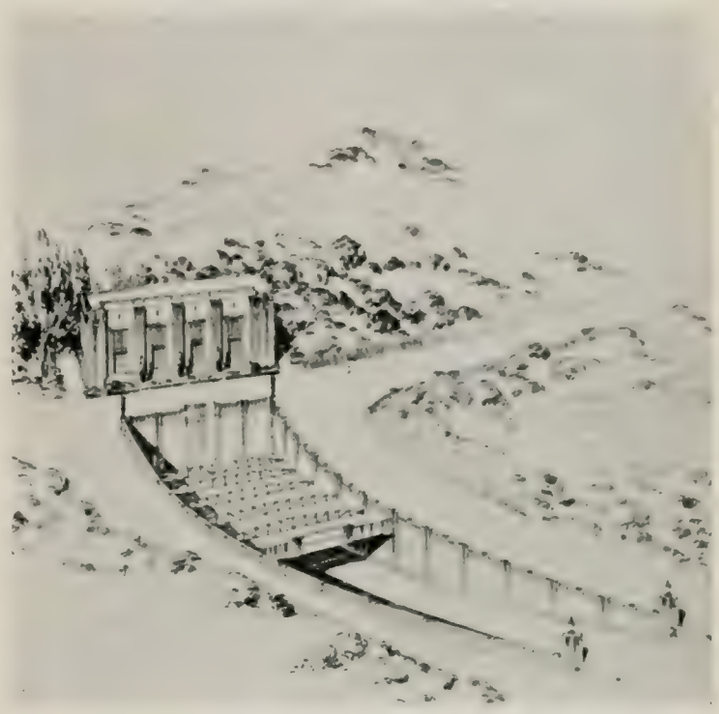
State Contributes $700,000 to Tunnel

(Continued from page 19)

A feature of the construction will be the light transition structures at each portal. Experience at other highway tunnels has shown that the eye does not adjust itself to the difference between the intensity of sunlight and the maximum practical artificial illumination in a tunnel with sufficient rapidity to insure good vision when vehicles are traveling at high speeds.

There has therefore been provided a transition section about 200 feet in length, which consists of an overhead louvre device supported upon the portal approach walls. These overhead louvres prevent direct rays of sunlight from falling upon the roadway area and thus provide a lighting of intermediate intensity as compared with the direct sunlight outside and the artificial illumination inside the tunnel.

The project involves the use of approximately 120,000 barrels of cement, 2500 tons of reinforcing steel, 1000 tons of structural steel shapes, the construction of about 700,000 square feet of 8-inch oiled macadam pavement, and the handling of over 1,000,000 cubic yards of material in grading and excavation. It is estimated that an average of approximately 900 men will be employed on the project over a period of from 18 months to two years.



LIGHT TRANSITION structures at each portal will aid drivers' vision.

STATE A LARGE CONTRIBUTOR

The estimated cost of construction is $3,752,000. A Federal PWA grant has been obtained by the joint highway district in the amount of $1,095,000. The balance of funds will be obtained through the sale of the district's bonds and the contributions of the State to the joint highway district.

The State has allocated $300,000 from its Joint Highway District Fund and a further contribution of $400,000 over a period of years is to be made by the State towards the project bringing the State aid to a total of $700,000.

Work is expected to start within a month, and to be completed in from 18 months to two years. The completed project will provide a new, modern highway route into Contra Costa County from Oakland and the East Bay cities. A distance saving of approximately two miles will be effected from the point where the new road diverges from Broadway, in Oakland, to where it joins the existing Tunnel Road in Contra Costa County.

Curvature on the new highway will be less than 600 degrees as compared with about 5000 degrees on the present Tunnel Road; the minimum radius of curvature is 800 feet, as against many curves with about 50-foot radius on the old road. Grades are 5.1 per cent maximum on the main highway approach and 4 per cent through the tunnels.

The present tunnel on the old road has only 17 feet clearance between side walls and the highway approaches are on approximately a 6 per cent grade, and have from 20 to 25 feet of paved width with practically no shoulder areas. The new highway will have 40 feet of paved surface and minimum shoulder width of 10 feet on each side.

AVOIDS LOCAL FOG

The Fish Ranch Road, used as an alternate route, has grades up to 16 per cent, is narrow, crooked, and crosses at a summit about 500 feet higher than the new road; it is also subject to a great deal of local fog at the upper elevations.

The new route will connect directly with the business center of Oakland and the dis-

(Continued on page 32)

Oregon Orator Lauds Californians' Spirit of Loyalty to State

(Continued from page 6)

of the slogan, "Once a Californian, always a Californian."

G. T. McCoy, Assistant State Highway Engineer, was introduced as the man behind the guns, in the State highway building program. He said that the district of northern California was the most wonderful in which he had ever worked and declared the purpose of the department to make the road all the way to Redding as fine a highway as the completed section of the cut-off.

MANY OFFICIALS PRESENT

E. B. Hall, president of the Shasta-Cascade Wonderland Association, Klamath Falls, Oregon, congratulated Shasta County and the State on the finishing of the important link in the great projected highway that is of interest to Oregon people.

Other officials present were: F. W. Haselwood, District Engineer, California Division of Highways; George Cunning, director of the Klamath County Chamber of Commerce, Klamath Falls, Oregon; A. H. Banwell, manager of the Medford Chamber of Commerce, Medford, Oregon; A. H. Gronwoldt, vice president of the Shasta-Cascade Wonderland Association, Redding; State Senator Harold L. Powers of Eagleville, California; William Boucher, California State Chamber of Commerce, Sacramento; William G. B. Chase, Klamath County Commissioner, Klamath Falls, Oregon; John W. Howe, Secretary, California Highway Commission, Sacramento; Frank Durkee, legal department, California Highway Commission, Sacramento; B. K. Snyder, director of Shasta-Cascade Wonderland Association, Lakeview, Oregon; Clinton J. Fulcher, director of the Shasta-Cascade Wonderland Association, Lookout, California; George Grizzle, judge of Klamath County Court, Klamath Falls, Oregon; W. A. Gates, director of the Shasta-Cascade Wonderland Association, Medford, Oregon.

The evening before the celebration, Director Earl Lee Kelly was the honor guest at a birthday banquet at the Golden Eagle Hotel in Redding tendered him by his home town friends and attended by guests from other parts of the State and the Oregon official visitors.

Jones picked up the newspaper and was astonished to see an article stating that he had been killed in an accident. He immediately rang up a friend.

"Bill," he asked, "have you seen the article about my death, in the morning paper?"

"Yes," replied Bill, "where are you talking from?" —*Excavating Engineer.*

Broadway Tunnel to Provide Important Highway Connections

(Continued from page 31)

tance of travel through built-up areas to the business center will be about one-third that of any other main highway into Oakland. Connections with the San Francisco-Oakland Bay Bridge are made by either the Berkeley connection and Ashby Avenue or by Broadway, in Oakland, to the intermediate approach in the vicinity of Thirty-eighth Street.

Adequate and advantageous connecting roadways from the main routing, one to Berkeley and one to East Oakland, constitute important features of the project and extend to a wide area proportionate benefits ascribed to the direct routing. The connection with the Fish Ranch Road at the east portal likewise adds considerable value for local traffic and loop routing.

The work is to be performed by Joint Highway District No. 13 of the State of California. Thos. E. Caldecott, a supervisor of Alameda County, is president of the board of directors; Harry M. Stow, a supervisor of Contra Costa County, is secretary of the board, and Henry L. Hinman of Oakland is the third member of the board and treasurer of the district. Archibald B. Tinning of Martinez is attorney, and Wallace B. Boggs of Oakland is the district engineer.

HIGHWAY BIDS AND AWARDS FOR APRIL

(Continued from page 30)

Inc., Berkeley, $9,520; Ransome Co., Emeryville, $9,040; Chas. Kuppinger, Lakeport, $8,960; Peninsula Paving Co., San Francisco, $9,400; Helwig Construction Co., Sebastopol, $9,440; E. A. Forde, San Anselmo, $8,800. Contract awarded to L. A. Brisco, Arroyo Grande, $7,800.

TEHAMA COUNTY—Treating with fuel oil between Route 3 and Wells Creek. District II, Route 29, Section D, E. C. F. Fredricksen & Sons, Lower Lake, $8,585; Tiffany Construction Co., San Jose, $8,855; Hemstreet & Bell, Marysville, $9,971. Contract awarded to E. A. Forde, San Anselmo, $8,470.

YOLO, SUTTER, COLUSA, GLENN & BUTTE COUNTIES—Treating with fuel oil. District III, Routes 99, 87, 88, and 21, Section B. A. Teichert & Son, Sacramento, $10,934; C. F. Fredricksen & Sons, Lower Lake, $10,938. Contract awarded to E. F. Hilliard, Sacramento, $10,002.

The strong man, gleaming knife in hand, gazed at the smooth, white body in the water. "I can not do it!" he groaned. "It is not man's work." Tears streamed from his eyes. The woman, with a look of utter scorn, seized the knife—and finished peeling the onion!—*Exhaust.*

STATE OF CALIFORNIA

Department of Public Works

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EARL LEE KELLY----------Director

MORGAN KEATON----------Deputy Director

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Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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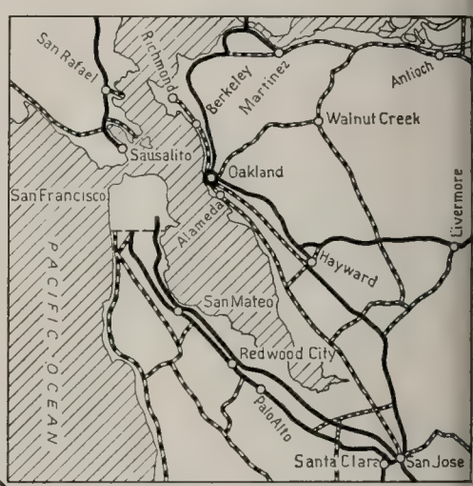
CALIFORNIA STATE PRINTING OFFICE
HARRY HAMMOND, STATE PRINTER
SACRAMENTO, 1934

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM
1933

LEGEND
Primary Roads
Secondary Roads



SAN FRANCISCO AND VICINITY

LOS ANGELES AND VICINITY

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CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

Grizzly Dome presents a highway problem in Feather River Canyon.

Official Journal of the Department of Public Works
JUNE 1934

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California Gets $7,932,206 this Year for Highways Under Act of Congress

Hayden-Cartwright Bill Provides $200,000,000 for Emergency Construction by States During the 1934-35 Fiscal Period. Further Gasoline Tax Diversions Made Prohibitive

By **EARL LEE KELLY**, Director of Public Works

CONTINUANCE of the State highway construction program, which has been such a factor in the relief of unemployment in California during the past nine months, is now assured by the passing by Congress on June 9th of the Hayden-Cartwright bill signed by the President June 17th.

By submitting this act to the President for approval, Congress has recognized highway construction as a most effective form of public works for widespread relief of unemployment and has provided the States with the means for the continuation of the mammoth National Recovery road construction program.

To California, the enactment of this federal legislation means that State highway construction activities will continue without abatement and that employment will be furnished to thousands of citizens of the State during the coming year.

NEW FEDERAL FUNDS	
Available 1934-35	$200,000,000
California's share	7,932,206
Available 1935-36	125,000,000
*California's share	4,000,000
Available 1936-37	125,000,000
*California's share	4,000,000

*Approximate figures.

This aid for road construction comes at a most opportune moment, as less than 5 per cent of the $15,607,000 in Federal funds apportioned to California under the National Industrial Recovery Act of last year are allotted to State highway projects which have not been let to contract or advertised for bids.

The enactment of the Hayden-Cartwright measure assures California of approximately $8,000,000 of Federal funds immediately available for State highway construction and an additional $4,000,000 Federal aid for each of the two years beginning July 1, 1935.

The bill as originally introduced by Mr. Wilburn Cartwright, Representative from Oklahoma, and Senator Carl Hayden, from Arizona, provided for the appropriation of $400,000,000 for State highway construction and several lesser amounts for road construction through National Forests, Indian Reservations, National Parks and Monuments and across unappropriated or unreserved public lands.

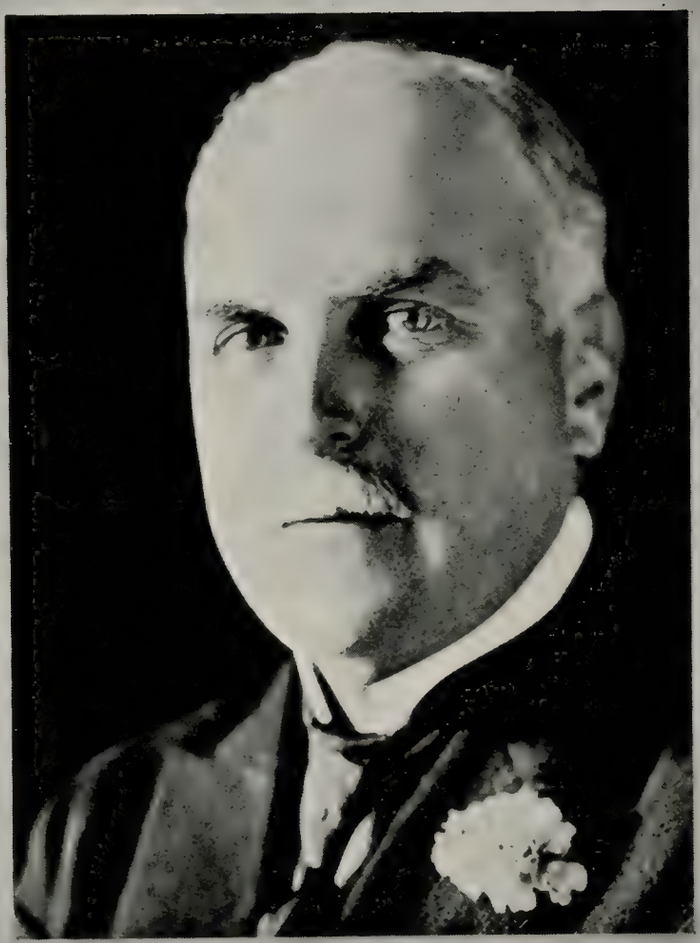
After reference to the Committee on Post Offices and Post Roads the bill with amendments was favorably reported out of committee and, as amended, and passed, provides for an appropriation of $200,000,000 for emergency construction of State highways, available this year, the money to be apportioned to the several States under the provisions of the National Industrial Recovery Act, and for an appropriation of $125,000,000 for each year of the two-year period beginning with July 1, 1935, for Federal aid on State highway construction, this money to be apportioned among the States under the provisions of the Federal Highway Act.

The act also appropriates $24,000,000 for National Forest, Park, Indian Reservation and public land roads for the fiscal year beginning July 1, 1934, to be expended under the provisions of the National Industrial Recovery Act and, for each of the two fiscal years beginning July 1, 1935, $10,000,000 for

(Continued on page 10)

In Memoriam

James Rolph Jr.



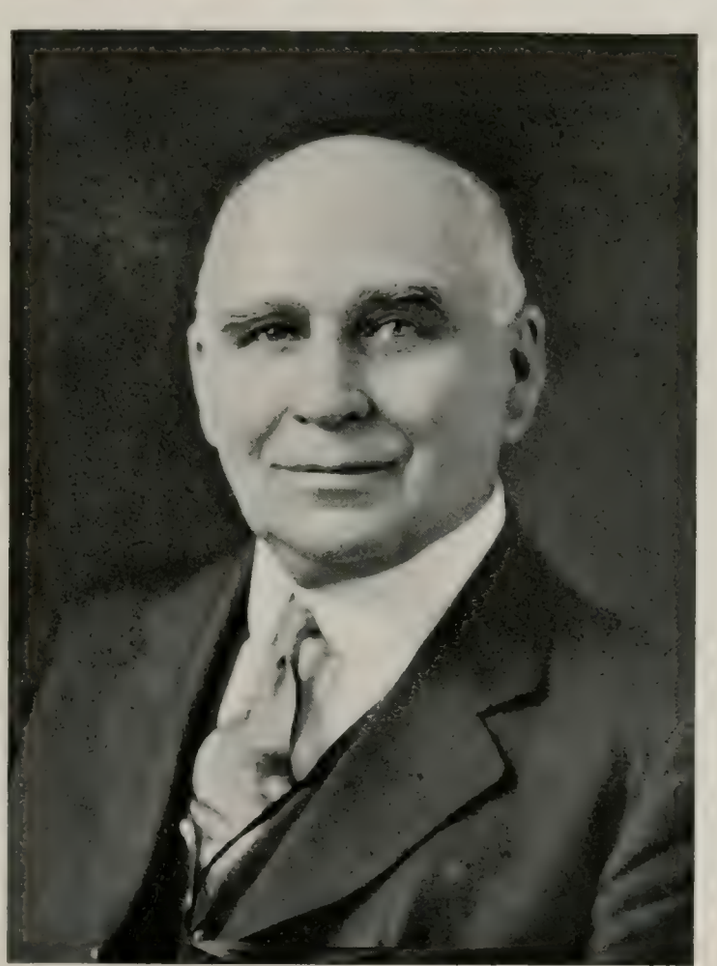
Governor of California

January 1931 - June 1934

Frank Finley Merriam Takes Office as Chief Executive of California

LIEUTENANT GOVERNOR Frank Finley Merriam of Long Beach was sworn into office as Governor of California following the death of the late Governor James Rolph, Jr., on June 2, 1934.

In addition to becoming the State's chief executive, as provided by law, he will continue to serve as Lieutenant Governor, President of the Senate, member of the Board of Regents of the University of California, Chairman of the Advisory Pardon Board, member of the Department of Penology and Chairman of the California Toll Bridge Authority.



FRANK FINLEY MERRIAM

The man who occupies this exalted position of power, authority and leadership in the affairs of the State has had a most varied, interesting and successful career in business and political life as educator, editor and banker, and official of civic and fraternal bodies.

He was born on a farm near Hopkinton, Iowa. His father, Henry Clay Merriam, was Masssachusetts born, an Iowa pioneer and Civil War Veteran; his mother, Anna E. Finley, was of Irish parentage and a native of famous Pike County, Missouri. The son was the eldest of eleven children and inherited many of the sterling qualities which characterized the life and deeds of his parents.

Frank F. Merriam was educated in the public schools and at Lenox College from which he was graduated in 1888. He earned his way through college, first as janitor, then as librarian and later as teacher. During vacations he worked on a farm or at carpenter work. He was an honor man, winning the college oratorical contest and representing his institution in the State association.

Immediately after graduation from Lenox College, he was elected principal of the Hopkinton schools where he remained three years. He was then elected superintendent of the schools at Wisner, Nebraska, and reelected for the ensuing year but resigned to take charge of the speakers' bureau of the Iowa Republican State Committee in the presidential campaign. Returning to teaching after the campaign, he was principal of the Hesper, Iowa, schools and then superintendent at Postville, Iowa.

Having purchased the *Hopkinton Leader*, he finally gave up school work to engage in the newspaper business. In connection with his newspaper work, he was elected clerk of the House Committee on Appropriations and at the next session clerk of the Senate Committee on Judiciary of the Iowa Legislature; in 1896 and 1898 he was a member of the House of Representatives and by reason of his experience early became a leader and chairman of one of the most important committees.

STATE AUDITOR OF IOWA

In 1898 he was nominated and elected Auditor of the State of Iowa on the Republican ticket, later receiving the nomination for a second term without opposition and elected

(Continued on page 12)

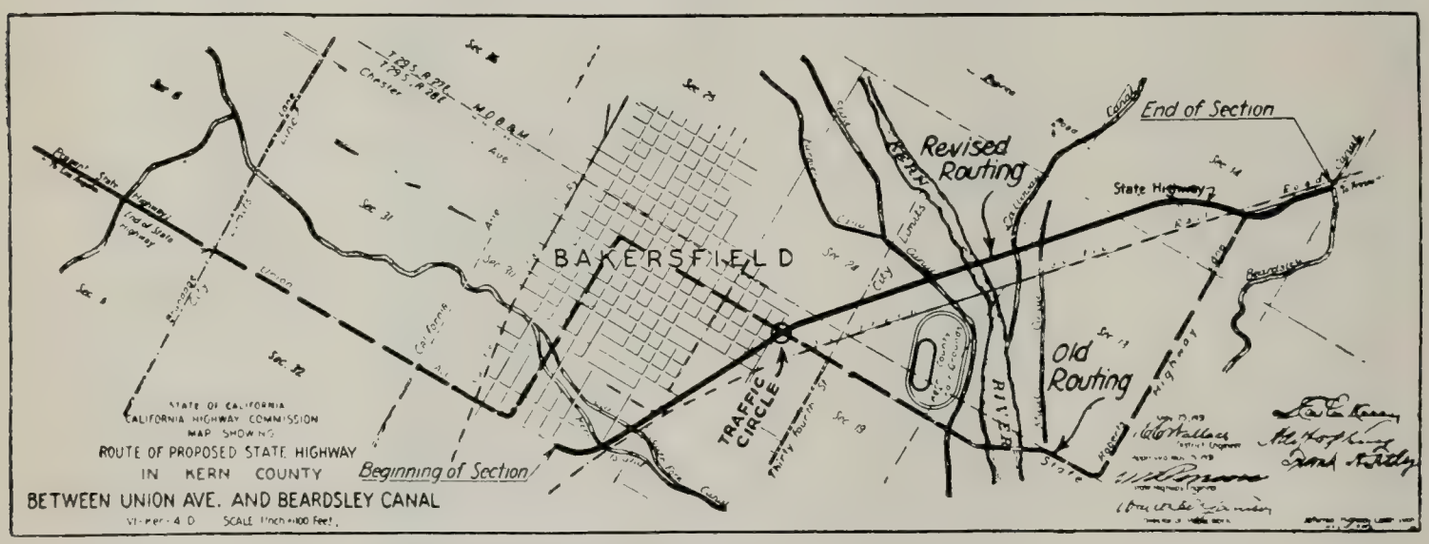
Bakersfield By-Pass Relocation is Opened with Dedication Ceremonies

By **R. S. BADGER,** District Construction Engineer

WITH simple ceremonies the new Bakersfield by-pass for Golden State Highway traffic, representing a co-operative investment of more than $900,000 by city, county and State, was opened to the public on Saturday, June 2, by Chairman Harry A. Hopkins of the California Highway Commission.

The brief exercises, participated in by public officials and civic leaders, were held on the imposing new over-pass structure near Oil Junction at the north entrance to the city of Bakersfield.

Supervisor Stanley Abel of Kern County presided as master of ceremonies and brief addresses were made by Mayor J. R. Gist of Bakersfield; Deputy Director Morgan Keaton of the State Department of Public Works, representing Director Earl Lee Kelly; State Highway Commissioners Philip A. Stanton of Anaheim and Frank A. Tetley of Riverside. The outstanding highway improvement is the result of complete cooperation between the County Planning Commission, the city government and the State Division of Highways.



SKETCH MAP showing old and revised routings

DANGEROUS CROSSINGS AVOIDED

After studying surveys of alternate routings for U. S. No. 99 at Bakersfield, all interests combined on one which avoids the objectionable features of the old route, with its many right angle turns, two grade crossings of multiple trackage, the use of narrow bridges over Kern River and Beardsley Canal, all of which features tended to make the old route slow, awkward and dangerous. The new routing also satisfactorily relieves congestion of traffic in Bakersfield streets through by-passing the heavy through traffic.

As one travels northerly, the highway now follows Union Avenue to 20th Street whence, by an easy curve, it turns northwesterly and roughly parallels the Southern Pacific Railroad with a 30-foot, three-lane asphaltic concrete pavement, flanked on each side by 3 feet of bituminous treated crushed rock borders.

As it crosses Chester Avenue it passes through a traffic circle of 320 feet diameter where traffic from U. S. Route No. 99 can turn into Bakersfield or continue on the by-pass, and where traffic to and from Oildale and Bakersfield can weave in or out of the through traffic with ease and safety.

Further to the northwest it crosses two large canals and the Kern River, the latter on a four-lane bridge of concrete deck supported by timber trestles at approaches and by steel girders and concrete piers at river spans. This bridge is 2293 feet long, has 40 feet of clear roadway width with concrete curb and 4 feet of concrete sidewalks on each side. Its deck is divided into four lanes by built-in-place traffic stripes. The aluminum painted iron railing, together with ornamental lamp posts on each side, helps to give this spacious, plainly designed bridge, an

(Continued on page 22)

BAKERSFIELD BY-PASS UNITS examples of modern construction. At top, four-lane steel and concrete overpass spanning railroad tracks. Center, portion of 30-ft. asphaltic concrete pavement with 3-ft. shoulders. Below, steel and concrete bridge over Kern River, 2293 feet long with 40-ft. roadway.

$322,000 Viaduct Improvement at San Bernardino Completed and Open

IN THE presence of hundreds of citizens from San Bernardino and Colton the Mount Vernon Avenue viaduct over the tracks of the Santa Fe Railroad in San Bernardino was dedicated with impressive ceremonies and officially opened to the public on Saturday, June 9th.

Chairman Harry A. Hopkins of the California Highway Commission gave the dedicatory address and formally accepted the causeway for the people of California.

Frank A. Tetley of Riverside, member of the California Highway Commission, cut the blue ribbon that opened the bridge to public travel.

TRIBUTE PAID SPONSORS

Superior Judge Charles L. Allison gave an address honoring the memory of the late Raymond Harris in recognition of the leading part he took in the Chamber of Commerce campaign to obtain the viaduct. Tribute was paid by Mayor E. F. Harford of Colton to the memory of the late Supervisor Milton T. Cheney for his part in bringing about the major improvement.

Chairman Clyde C. Whitney of the Chamber of Commerce Viaduct Committee introduced the other speakers, who included President R. A. Stockwell; Morgan Keaton, Deputy Director of Public Works representing Director Earl Lee Kelly; Mayor O. W. Seccombe; Philip A. Stanton of Anaheim, member of the California Highway Commission; F. W. Panhorst, Acting State Bridge Engineer, E. Q. Sullivan, District Engineer, M. E. Whitney, Resident Engineer, Supervisor John Andreson of San Bernardino; members of the city council and other local officials and railroad representatives.

REPRESENTED GOVERNOR

Mr. Hopkins prefaced his dedicatory address by conveying to the audience the regrets of Governor Frank F. Merriam that he was unable to attend the ceremonies at the invitation of the city. He then officially accepted the new viaduct and supplemental improvements on behalf of the people of California, citing the project as another important betterment of the State highway system comprising as it does a new western approach to the city and providing a gateway for the traffic of Cajon Pass.

The new viaduct is a steel reinforced concrete bridge over the tracks of the Atchison, Topeka and Santa Fe railroad yard, costing $190,000 and affording four lanes for vehicular traffic and two pedestrian walks. The improvement has long been a necessary one because the alignment of the old viaduct was especially poor, making what was practically a right-angle turn in its 21-foot roadway at its highest point above ground.

CALLED "DEATH TRAP"

In addition to being inadequate for modern highway loads it was the scene of several fatalities which caused it to be regarded as a danger point. Built in 1907 it consisted of steel floor beams and stringers with a wooden floor surfaced with asphalt and extended 550 feet along Mount Vernon Avenue and 385 feet easterly, parallel to and 300 feet north of Third Street.

The new viaduct has a 40-foot reinforced concrete roadway with a 3-foot 6-inch sidewalk on each side and an overall length of 1016 feet. It has flared approaches giving easy access at either end. This was accomplished in part by cutting through a new street and rerouting the Pacific Electric tracks. The complete project involved the relocation of the street railway tracks at an estimated cost of $14,000 and yard changes by the Santa Fe Railroad Company at an estimated cost of $13,000. New street work cost $58,000 and rights of way $30,000.

FINANCED WITH FEDERAL AID

The total cost of the entire improvement project including the viaduct, approaches and work done by the railroads will approximate $322,000. It was financed from State and Federal funds, the county paying for the necessary rights of way.

The contract, which was awarded October 2, 1933, allowed nine months to complete the work. The contractor finished the job in 5½ months, or 3½ months ahead of schedule.

R. W.: "Do you know what happens to little boys who use bad language when they play marbles?"
Boy: "Yes, sir, they grow up and play golf."

A BROAD SPAN of concrete and steel now carries the highway over the railroad yard at San Bernardino as shown at top. 2. One of the wide, flaring approaches. 3. Old, narrow structure with right-angle turn. 4. Official group at dedicatory ceremonies (left to right): Chamber of Commerce President Ray Stockwell; Mayor A. W. Seccombe; State Bridge Engineer F. W. Panhorst; Highway Commissioner P. A. Stanton; Deputy Director of Public Works Morgan Keaton; Highway Commissioner F. A. Tetley; Chairman C. C. Whitney; Harry A. Hopkins, Chairman Highway Commission; Mayor E. F. Harford, Colton; R. H. Mack, Secretary Chamber of Commerce; Supervisor John Andreson.

Court Upholds Outdoor Advertising Act and Enforcement Campaign is Renewed

By **MORGAN KEATON,** Deputy Director of Public Works

ONE of the most important decisions of recent years in connection with the control of outdoor advertising was rendered on May 23, 1934, by Superior Judge Fitzpatrick of the City and County of San Francisco, who ruled that the Outdoor Advertising Act as passed by the last session of the Legislature is constitutional.

The act was attacked in court by the Special Site Sign Company of Oakland, California, alleging that the act is unconstitutional on the ground that it is double taxation and deprives persons of their property without due process of law. Both of these points were decided in favor of Director Earl Lee Kelly, the Department of Public Works, against whom the suit was filed.

The suit had attracted nation-wide attention because several other States have similar laws but in no case has the constitutionality of such acts been tested in the courts. Also, the California decision was being watched by a number of other States who are contemplating passing similar laws.

MORGAN KEATON

REMOVAL CAMPAIGN BEGINS

In rendering this decision, Judge Fitzpatrick dissolved the restraining order placed upon the Department of Public Works against the enforcement of the provisions of the Outdoor Advertising Act. Therefore, the decision now permits its full enforcement and it is now the plan of the director to immediately start a campaign to clean up all nonconforming sign boards existing on any of the highways in California. This will be done by beginning removal on the heavily traveled highways first.

All signs or structures within 300 feet of intersections not in subdivided areas, in unincorporated sections of the State, will be eliminated as well as all signs and structures that are in an unsafe condition, in drainage channels, or obstructing the view of the highways for 500 feet. The act provides that any signs or structures that come within the above violations are public nuisances, and according to the wording of the Civil Code no notice is necessary for the removal of public nuisances. However, in view of the fact that the act provides for a ten days' notice to the owner of the sign or structure, this procedure will be followed.

800 PERMITS ISSUED

During the waiting period pending the decision of the case filed against the director, the work of the department was considerably hampered by the reticence of owners of signs and structures to pay the fees in compliance with the law. Yet, in the face of the delay, over 200 persons or corporations have applied for licenses to operate an "Outdoor Advertising Business" and permits have been issued for approximately 8000 structures and 3500 signs throughout the State to date.

In connection with the enforcement of the act, considerable comment has been forthcoming concerning political candidates' outdoor advertising problems. This act includes all advertising of every nature in unincorporated areas in view of any highway, whether county or State. Therefore, any candidate tacking up quarter cards on private property without the permission of the property owner involved and without securing a permit from the Depart-

The Axe is About to Descend

Cartoon by Buel—Courtesy Sacramento Bee

CALIFORNIA
STATE BILLBOARD LAW
STOP AT THE SOAKUM
TRY OUR HAM 'N EGGS
STAR CAFE MAIN STREET
HOT DOGS 1/4 MILE
USE SKRUBO IT REMOVES THE DIRT
YOU ARE NOW LEAVING PUNKVILLE WE THANK YOU
BUEL

ment of Public Works to erect such a sign or structure is liable under the terms of the act and may be prosecuted the same as anyone else using the outdoor advertising method of advertising.

NO HARDSHIP INTENDED

In view of the multiplicity of candidates, National, State, and local, the problems of the department in the enforcement of the act will be many and arduous between now and the general election on November 6, 1934.

Therefore, it shall not be the desire or wish of the department to cause any hardship upon any candidate for public office but it is the hope of the department to enforce the provisions of the act, which is a mandate of the State Legislature, fairly and fearlessly upon all persons who come within the purview of the law.

100 Per Cent Federal Grant for 1934-35

(Continued from page 1)

National Forest roads and trails, $7,500,000 for National Park roads, $4,000,000 for Indian Reservation roads and $2,500,000 for main roads across public lands.

These latter appropriations, while having little effect on State highway construction, are of great benfit to the western States, as the greater portion of these parks and public lands are in the eleven western States.

Certain of the provisions of the act demand special mention and attention is called to the new "set up" in the aid of the National government to the States in highway construction.

The $200,000,000 appropriation for the coming fiscal year is a "100 per cent grant" appropriation and does not require the States to match Federal funds with State funds.

There is also a provision which permits the Secretary of Agriculture, upon proper application of State highway departments, to use up to $10,000,000 of the funds appropriated, for the repair or reconstruction of highways and bridges damaged or destroyed by floods, hurricanes, earthquakes or landslides.

Section 4 of the act, which provides for the $125,000,000 a year for two years beginning July 1, 1935, sets in operation again the old Federal-aid contributions which began in 1916. This money must be matched by the States with their own funds and is subject to the requirements of the Federal Highway Act.

LIMITATIONS PROVIDED

Sections 9 to 15 of the new act are special provisions applying to all funds appropriated by the act, and of these sections 11, 12, 13 and 14 are of vital importance to the States among whom these Federal funds are to be apportioned.

One of these provisions is that, with the approval of the Secretary of Agriculture, not more than 1½ per cent of the amount apportioned to a State in any one year may be used for surveys, plans and engineering investigations of projects for future construction on the Federal-aid highway system or on secondary or feeder roads. While this provision is not of great importance in California, where the development of the State highway system is well planned, there are many States to which this use of Federal funds will be of great assistance.

Section 12 provides a requirement which is of utmost significance as it definitely sets forth the government's position in regard to the diversion of motor vehicle and gas tax revenues to purposes other than highway construction and maintenance.

PROHIBITS FURTHER DIVERSIONS

The words of the act are unmistakable: "Since it is unfair and unjust to tax motor vehicle transportation, unless the proceeds of such taxation are applied to the construction, improvement or maintenance of highways, after June 30, 1935, Federal aid for highway construction shall be extended only to those States that use at least the amounts now provided by law for such purposes in each State from State motor vehicle registration fees, licenses, gasoline taxes and other special taxes on motor vehicle owners and operators of all kinds for the construction, improvement and maintenance of highways * * *"

Another provision lifts the limitations set forth in the Federal Highway Act as to Federal participation up to a limited cost per mile for construction and to such participation within the limits of municipalities.

Section 14 waives any further repayments by the States to the Federal government on account amounts paid or advanced to the States under the Federal Highway Act or the Emergency Relief and Construction Act of 1932.

CHAMBERS OF COMMERCE HELPED

The passage of this act by the second session of the 73d Congress has assured the Nation of continued assistance on the road back to recovery, but it must be remembered that the action of Congress was only at the instance of the people. The California Highway Commission, upon the recommendation of the Director of Public Works, at its meeting on April 6, last, passed a resolution requesting Congress to pass this act and Mr. Harry A. Hopkins, chairman of the commission, went to Washington to lend his support to those others from many States who were working for its passage.

(Continued on page 11)

Gasoline Sales Tax Report Shows Gain in Revenue for State

CALIFORNIA gasoline taxes for April amounted to $3,643,836.19, exceeding the April collections for the past three years, according to the latest report made by the State Board of Equalization. The month's tax surpassed that for April, 1933, by $288,387.22 marking a gain of 8.5 per cent.

"Comparisons of monthly distributions of motor vehicle fuel for years prior to 1931 can not be made readily from our records," says the report, "because the tax was not paid on a monthly basis until April of that year. Before then, oil companies made their returns to the board for quarterly periods.

PRACTICALLY NO DELINQUENCIES

"Payment of the tax each month, as advocated by the board, has proved of great benefit to the State in reducing losses through failure of gasoline distributors to meet their tax obligations. Despite the trying financial period during which we have passed there have been practically no delinquencies in the three cents per gallon motor vehicle fuel tax.

"Although the gasoline tax for April was considerably less than the March total of $4,048,511.61, which marked a gain of 24.4 per cent over the corresponding month of 1933, the figure is indicative of a substantial upward trend in the petroleum industry."

HIGHWAY COMMISSION ACTED

(Continued from page 10)

Copies of the commission's resolution were sent to every Chamber of Commerce in California with the request that they pass similar resolutions and inform their Congressmen and Senators of their desire for the legislation.

It was only through the cooperation and united efforts of a great army of American citizens from all States, who are interested in highway development and who realize the effectiveness of highway construction as an unemployment relief measure, that this aid from the Federal government was granted, and California is proud of the efforts of her sons who so ably assisted, and now she steps forward again with an intensive highway construction program which will provide employment and the necessities of living for thousands of her citizens and their families.

ROADS AND STREETS GIVING JOBS TO 3,000,000 MEN IN U. S.

Road building has been tested during the past year as a means of relieving unemployment and has been found most satisfactory, according to W. R. Smith, President of the American Road Builders Association. More than a million men are now employed on roads and streets. Two other men are busy furnishing each road worker with supplies, he estimated.

"Money spent on public roads is spread over a wide area in both country and city. The dollar spent in road and street construction has double value; it pays the bills of the worker, and thereby aids in the creation of a stronger market for commodities, and it has a permanent value in decreasing the cost of highway travel that affects everyone," continued Mr. Smith.

"A man out of a job needs it where he lives and road and street work bring the job to him. Highway work readily absorbs men from all classes of industry temporarily inactive. Relief of unemployment might well be concentrated on road and street construction that has been tested and found efficient."

New Sheets Available of Topographic Map

Advance sheets of a revision of the Truckee Quadrangle of the new State topographic maps are now available on a scale of 1/96000. The field work in connection with the revision was carried on in 1932 and the sheet will later be published in color on a scale of 1/125000 with a contour interval of 100 feet. This sheet was originally surveyed in 1889 and the maps heretofore available did not show roads, trails, and culture as of today so that the new edition will be a distinct boon to recreationists in the Tahoe-Truckee area.

Final sheets of the La Cima Quadrangle are now available. This topographic sheet covers an area in Fresno and Kings counties in the Kettleman Hills area. It is published on a scale of 1/31680 with a contour interval of 5 and 25 feet.

Both of the above described sheets were produced by the U. S. Geological Survey in cooperation with the State of California, acting through the State Engineer's office.

Visitors were present:

"Daddy, may I have a dime?" asked little George. Daddy obliged with a smile.

"This time you won't make me give it back after the company's gone, will you, daddy?" was the son's loud remark.

Governor Merriam Leader in Civic Life

(Continued from page 3)

by nearly one hundred thousand majority over the fusion candidate. Following his occupancy of the Auditor's office, Mr. Merriam removed to Muskogee, Indian Territory, where he engaged in the newspaper business, first as owner and editor of the *Times* and later as half owner and business manager of the *Phoenix*. Owing to sickness in the family the Merriams removed to Long Beach, California, in 1910, and have since made that city their home.

Mr. Merriam's California experience has been exceedingly pleasant. For ten years he was connected with the advertising department of the *Long Beach Press,* resigning as advertising manager to give personal attention to other business in which he had become interested. In 1924 he became president of the Citizens State Bank of Long Beach; entering the political campaign in 1926, he resigned the presidency although remaining with the bank as director and vice president. In recent years he has been a broker and engaged in the real estate business in addition to his banking connection.

SPEAKER OF THE ASSEMBLY

Business success, however, does not measure the attainments of Governor Merriam in Long Beach. In 1916 he was elected to the California Assembly from the Seventieth District and was reelected in 1918, 1920, 1922 and 1924. The last two elections were practically unanimous since no Republican candidate opposed him either in the primary or the general election. He was elected Speaker of the forty-fifth and forty-sixth sessions and served with great credit and distinction.

Friend W. Richardson's successful effort to secure the Governor's office in 1922 received Mr. Merriam's support and he had full charge and management of the campaigns in southern California for the primary and the general election. The presidential primary campaign for the selection of delegates to the Republican National Convention in 1924 again brought Mr. Merriam into prominence, this time as one of the managers for Calvin Coolidge in southern California.

WON POLITICAL HONORS

In 1928 he was elected State Senator from the Thirty-third District for a term of four years. Less than a month later another honor came to Mr. Merriam in his selection as chairman of the Republican State Central Committee.

Although he had served but half of his term in the State Senate, he was nominated for the office of Lieutenant Governor on the Republican ticket at the primaries in August, 1930, and at the November election was elected by the largest vote ever accorded a candidate for Lieutenant Governor in the State of California.

Few men are held in higher esteem at his home in Long Beach than Governor Merriam. He served three years as president of the Red Cross Chapter; was chairman of the Boy Scout Council; served for several years as president of the Federated Church Brotherhood of Long Beach; is a charter member of the Advertising Club and served as president; is a member of the Sons of Veterans and of the Chamber of Commerce. He was a Four Minute Speaker during the war period and was active in the campaigns for sale of liberty bonds and war savings stamps.

PRESIDENT OF CIVIC BODIES

By reason of his election to the Speakership of the Assembly he was Regent of the University of California for four years; he was president of the Harbor District Chambers of Commerce (a federated organization of more than sixty Chambers of Commerce and Improvement Associations) for five years; was president of the Long Beach Kiwanis Club for the year 1927; is a past president of the Iowa Association for Southern California; is superintendent of the Sunday School of the First Presbyterian Church and is serving his ninth year as president of the Men's Brotherhood of that church. He is a Royal Prince of the Dramatic Order Knights of Khorassan and Past Grand Chancellor of the Knights of Pythias of California.

Mrs. Nellie E. Merriam died very suddenly at Santa Rosa on July 6, 1931, as she and her husband were returning from a trip to Eureka where Mr. Merriam had delivered a Fourth of July address.

Visitor: "Well, Joe, how do you like your new little sister?"

Joe: "Oh, she's all right, I guess, but there are lots of things we needed worse."—*Pathfinder.*

The Maintenance Man

Since Adam blamed Eve for the apple
In words too lurid to quote,
There's always been some poor mortal
Who's fated to be the goat,
And the guy in the highway system
Like the dog who is tied to a can,
Is that poor and unsung hero
Entitled "The Maintenance Man."

For he blades his road in the morning
And leaves it a beautiful sight,
But a tractor goes through with a harrow or two—
You should see that road by night!

He cleans out his gutters and shoulders,
Then tears at his graying locks,
For the sheep come through and a thousand or two
Can scatter a million rocks!

He sweats all week with his hot pot,
Patching each hole, and then
The trucks come through with a trailer or two,
And he patches all over again!

He sets the posts for his guard rail
Two feet eight inches deep,
But a driver comes through with a drink or two,
And the guard rail's a kindling heap!

He places a red reflector
At a curve on the broad main line,
And a hunter comes through, takes a pot shot or two,
And that is the end of the sign!

So he patches his pavement
And toils with his blade,
Cleans out his ditches
And builds up his grade,
Replaces his guard rails,
Trims up his trees,
Crawls through his culverts
To clear out the leaves,
Lays dust oil in summer,
Sprays weed oil in spring,
Drives over each mile
Never missing a thing,
In short he does all
That he possibly can,
This poor patient guy
Called the "Maintenance Man;"
But whenever it rains
And the pavement gets slick,
Or the paint stripe fades
When the fog is thick,
Or a tourist gets dust
On his big sedan—
Who gets the blame?
Why, "The Maintenance Man!"

For since Adam blamed Eve for the apple,
And Cain sowed his first wild oat,
There's always been some poor mortal
Who's fated to be the goat,
And the guy in the highway system
Who everyone loves to damn
Is that poor, long-suffering creature
Entitled, "The Maintenance Man;"
And I think when he meets Saint Peter
And looks at the heavenly road,
Where the tractors all have street plates
And the trucks never over-load,
With never a broken guard rail,
No thistle or puncture vine,
No dust to lay, no weeds to spray
And never a shattered sign,
He'll turn to the worthy Peter with,
"Pete, this is surely swell,
"But I've heard of another district,
"We used to call it 'Hell,'
"And the roads are not so much there
"For they're 'paved with good intentions,'
"And I think that would suit me better,
"You see, I forgot to mention—"
"Just stop right there," Saint Pete will say,
"For now that I look at your pan
"I can see why you'd rather go Below—
"You're an old time Maintenance Man!"

—Gladys Craig Potter (Wife of C. A. Potter, Maintenance Superintendent, Marysville, California.)

Building a Viaduct Under Difficulties Where Teeming Traffic Lanes Cross

By **C. W. JONES**, Bridge Construction Engineer, Southern District

AT THE intersection of Sunset and Glendale boulevards, two major traffic thoroughfares in the heart of the city of Los Angeles, the State is constructing a new concrete viaduct. This structure will replace a dilapidated timber trestle which has served for the past 29 years to separate grades at this boulevard intersection.

Sunset Boulevard has ever been a heavy travel artery into the Hollywood area and it is roughly estimated that in the twenty-nine years of its service the old timber trestle has carried more than 100,000,000 vehicles over Glendale Boulevard, an equally busy arterial.

There are a number of interesting problems in connection with the work. Ordinarily it is not considered difficult to demolish a three-span timber trestle structure and construct a 90-foot concrete arch span.

In the case of the Sunset-Glendale structure, however, it will be necessary to accomplish this work without interrupting two lines of street railway traffic which cross the intersection, one over the structure and the other on the street level under it. This is being accomplished by constructing the arch one-half width at a time, building temporary trestle work and making three separate shifts of railway tracks and trolleys.

PUBLIC SERVICES MAINTAINED

In addition to the railway traffic, there is at this boulevard intersection a tremendous volume of vehicular traffic. It was found necessary to temporarily reroute this vehicular traffic over adjacent streets. In order to minimize this inconvenience, work is being rushed with all possible speed so that the structure may be in use as quickly as possible.

In addition to the traffic interference, there are pole lines carrying a maze of trolleys, cables and wires. There are also conduits, sewers and gas lines. All of this service has to be maintained. The temporary relocation and shifting of these lines of public utilities so that they will not interfere with construction work required considerable study, work and expense.

The structure is also hemmed in by buildings, some of which had to be underpinned and supported when excavation was made. It was also necessary to provide access to buildings where excavation removed street entrances and to provide for pedestrian traffic over and under the structure throughout construction.

CONCRETE PILES USED

Investigation showed that the natural ground formation could not safely support the proposed type of structure. Any appreciable spreading or unequal settlement of abutments in the case of this fixed concrete arch would prove disastrous. The poor ground formation has been made strong enough to support the structure by driving into it a large number of concrete piles.

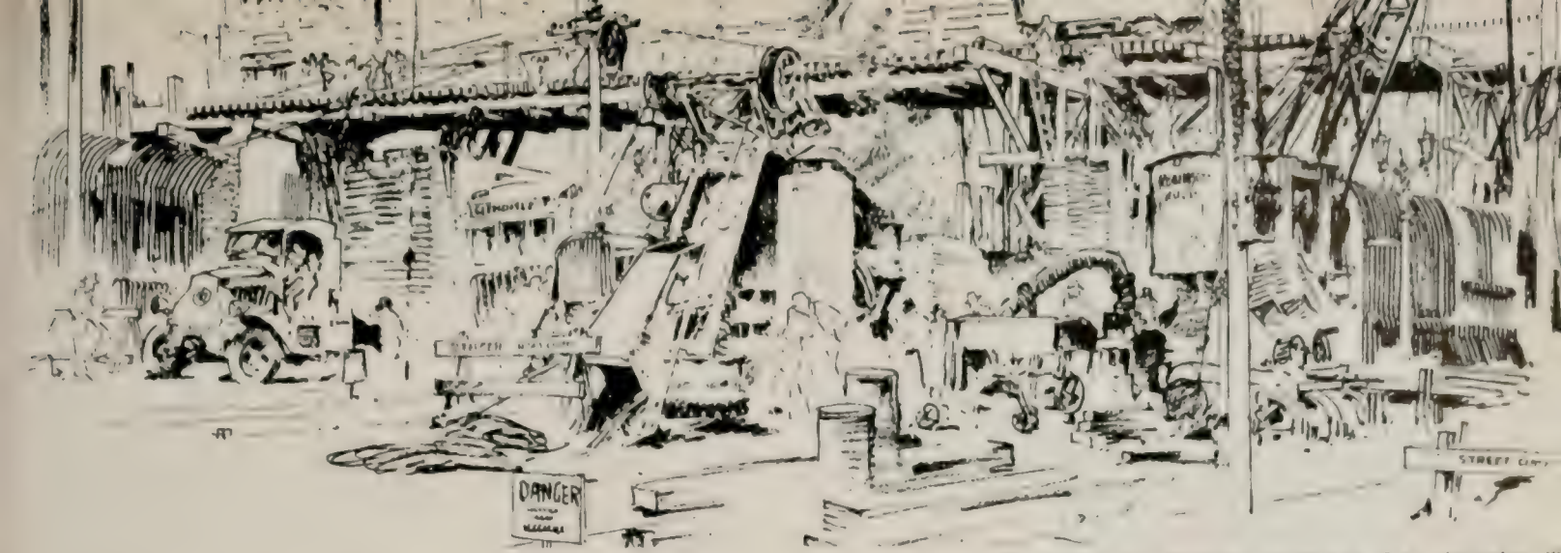
The original timber bridge consisted of three spans with intermediate piers through which traffic had to filter on Glendale Boulevard. The underclearance in the case of the old structure was barely sufficient to accommodate the trolleys of the street cars. It was decided to construct a clear span across the entire street without any central pier obstructions. It was also decided to maintain present street grades, for altering same would involve tremendous damage to adjoining property and make difficult the entrance to existing buildings.

In order to secure this long clear span free from central piers and at the same time not alter street grades nor encroach upon necessary trolley clearances it was necessary to design and build an extremely flat and shallow arch structure and during construction make use of heavy steel girders to temporarily support the falsework over the tracks.

MAXIMUM EMPLOYMENT PROVIDED

The structure is being financed from Federal aid funds. It is the desire of the Federal and State governments that these funds be expended to provide a maximum amount of employment. The contractor, under the contract as written, must do the work with laborers sent to him by the local United States employment office. He is also required to make use largely of hand labor methods.

(Continued on page 29)



Drawing by Owens, courtesy Los Angeles T

BUSY SCENE IN CITY'S HEART. Activities attendant upon the construction by the State of the $130,000 viaduct now being built over Glendale Boulevard at the intersection with Sunset Boulevard in the city of Los Angeles is shown in the top sketch by Artist Charles Owens of the "Los Angeles Times." The lower photographs show how the excavation and building work is being carried on without interrupting traffic of the two street railway lines on both levels of the grade separation.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 14 JUNE, 1934 No. 6

THE HIGHWAY PROGRAM

Every Californian should be proud of the vast highway improvement plan that has been mapped out for the current biennium, requiring the expenditure of no less than $34,000,000, and which has been speeded up to provide work throughout the State, until at the peak of activity during the early summer it is expected that it will furnish employment for no less than 18,000 men.

The two year program calls for the building of 1157 miles of new road, besides extensive improvements throughout the entire system. Every day's work expended upon permanent highway construction is a direct benefit to society in which all may share, and when the money has been paid out California will have something to show for its $34,000,000 that it has spent for employment.

California has set an example in highway construction that could be followed profitably by every other State in the Union. Why fritter away billions of dollars in useless projects when road construction offers a real investment in every community in the country? Here is a solution for unemployment that really gives the taxpayer something for his money and at the same time gives the employed the feeling that he is worthily engaged in constructive endeavor, rather than the beneficiary of a dole.—*Tustin News.*

TUNNEL PROJECT MEANS JOBS FOR HUNDREDS

Jobs for hundreds of men will be created when work starts on the low-level tunnel this month, and Contra Costa County will benefit directly by the launching of this first of the major public work projects to get under way in California.

For the untiring efforts of those responsible for shaping up the project and for driving through the details of financing and clearing away the legal obstacles, full credit is in order. * * * Their combined efforts are responsible for the early start, marked by the ground-breaking ceremonies on June 17.

Completion of the project is expected by January, 1936, and Diablo Valley, no less than the close-in districts, will be benefited at once.—*Brentwood News.*

22,000 Contractors Warned to Renew Licenses by June 30

CONTRACTORS and builders throughout California have been cautioned that they must file an application for the renewal of their State contractor's license before June 30, if they expect to remain in business.

Warning that the licenses of approximately 22,000 registered contractors would become delinquent June 30 was broadcast by Glen V. Slater, assistant State registrar of contractors.

Under State law, all contractors are compelled to register. The renewal fee is $5 if the renewal application is filed before June 30. A delinquent fee of $5, making a total license fee of $10, is required on all licenses issued after June 30. It is illegal for a contractor to operate without a license.

With an upward trend apparent in the building and construction industry, contractors and builders who fail to apply for their 1934–35 licenses before June 30 will be endangering their right to bid on new construction work.

Col. Carlos W. Huntington, State Registrar of Contractors, has so advised builders in urging prompt action in filing renewal applications.

The Registrar hailed the large number of renewal applications already filed as "further indication of a general improvement in building and construction operations."

"The heavy volume of renewal applications received in the Sacramento offices," Huntington said, "is gratifying and indicates a continued improvement in building and construction operations."

"The trend of business appears to be improved generally, and we feel confident that the 1934–35 registrations will exceed the total for the fiscal year ending June 30."

Projects Advertised for Bids

Improvements totaling $1,670,500 estimated cost are being advertised for bids during June. They comprise State highway improvements in eleven counties providing work in all parts of the State. The list includes 9 road jobs covering 121.8 miles and 3 bridge structures.

DETAILED LIST OF PROJECTS

County	Location	Type	Miles
Santa Barbara	Santa Barbara City	Grade Separation	(1)
San Diego	Escondido to Lake Hodges Dam	Graded Roadbed	5.5
Yolo	Bet. Woodland and Elkhorn Ferry	Untreated Gr. Base	3.9
Shasta	Across Sacramento R. at Redding	Steel Bridge	(1)
Monterey	Mustang Grade to Priests Valley	Graded Roadbed	3.3
San Diego	El Cajon to 1 mile easterly	Pavement	1.0
Nevada	Hinton to Floriston	Bituminous treated cr. rock surface	3.5
Colusa	Maxwell to Delevan	Pavement	5.5
Yolo-Sacramento	Across Sacramento River at Sacramento	Steel Bridge	(1)
Mono	Carringtons to Rush Creek & Hot Creek to Mammoth Ranger Station	Oil Roadbed	19.7
Ventura	Ojai to Westerly Boundary	Oil Roadbed	42.1
Kern	Rio Bravo to Wasco & Old Quarry to Sequoia National Park	Oil Roadbed	37.3

SUMMARY

Type	Miles	Amount
Pavement	6.5	$209,100
Bituminous Treated Crushed Rock Surface	3.5	17,800
Untreated Rock Surface	3.9	13,300
Graded Roadbed	8.8	262,800
Bridges and Grade Separation	(3)	1,108,700
Oiling Program	99.1	58,800
Totals	121.8	$1,670,500

L. A. COUNTY HIGHWAY NEEDS

Los Angeles County needs to spend $117,000,000 and to construct 6618 lane miles of highway before its road system can be regarded as adequate to meet the motoring needs of its residents and tourists. This estimate was furnished by the County Regional Planning Commission as a result of traffic counts and population surveys looking far into the future.

J. A. Mellen, highway engineer, says it will take 23 years to bring present county highways up to standard, under present incomes. State highways within the county will require 17 years to be regarded as adequate, Mr. Mellen says.

AUTO REGISTRATIONS INCREASE

A report issued by the Division of Registration, State Department of Motor Vehicles, shows for the first four months of 1934 increased registrations, more dealers and a greater number of transfers than for the same four months of 1933.

Registrations total 1,940,517, an increase of 34,692, or 1.82 per cent. This increase was reflected in every class of fee-paid registrations except solid tire vehicles. Dealers number 2948, an increase of 416, and transfers total 363,291, an increase of 13,948, or 3.99 per cent over last year indicating improved conditions in the motor car industry and in tourist travel.

Realignment of Redwood Highway in Humboldt Co. Eliminates 96 Curves

By **E. M. CAMERON,** District Construction Engineer

UPON the completion of the contract now under way in the vicinity of Garberville, in Humboldt County, two of the most dangerous sections left on the Redwood Highway will have been eliminated, one over the divide between Benbow and Garberville, and the other from Bluff Creek to a point seven miles north of Garberville.

The first portion, while not in an exceptionally difficult country, is governed by the necessity of crossing the divide between the two points in a limited distance, calling for a 7 per cent grade and an exceptionally heavy cut at the summit.

The second portion, a very dangerous section known as the Redway Bluffs, the scene of a number of fatal accidents, will be widened and straightened and the hazard to traffic at this point eliminated.

TWO SHOVELS WORKING

Two shovels, one 2½-yard and one 1½-yard, are working three five-hour shifts with the hope of completing this section well before the winter rains.

In the redwood area approximately one-half mile in length, it has been found necessary to remove a few trees ranging in size from two to ten feet. They are cut in suitable lengths and placed in the fills in the nature of cribs thus eliminating the necessity of disposing of the timber and giving a rustic appearance to those portions of the highway in the forest.

The total value of the work under contract is $375,500, which includes a three-inch plant-mix top. W. W. Compton is the Resident Engineer in charge.

BAD CURVES ELIMINATED

The following comparative table shows the great improvement in alignment between the new construction and the old road:

MAP SHOWS new highway in solid lines, old curves by dots

	Old	New
Maximum radius	3,700 ft.	10,000 ft.
Minimum radius	50 ft.	500 ft.
Total curvature	4,387°	945°
Number of curves	130	34
Length in miles	8.04	7.58

The portion of the old road between Benbow and Garberville was constructed in 1914 and the section north of Bluff Creek in 1917.

NEW ROAD TO THE PINNACLES OPEN

Supplanting the old one-way road which necessitated controls on the last mile into The Pinnacles National Monument, a new road built by the National Park Service has been opened to traffic. The Pinnacles is an area of nearly 5000 acres containing rock formations of impressive beauty and inspiring scenic vistas.

"Dearest," sighed the young man, "couldn't you learn to love me?"

"I might," said the girl. "I learned to eat spinach."

THROUGH THE REDWOODS in Humboldt County dangerous sections of the State highway are being relocated and many sharp curves eliminated. The top picture shows clearing operations preparatory to straightening the road at one of the curves. Below, at left, is a view of grading operations on the precipitous Redway Bluffs. At right is a picture of one of the redwood cribs used for fills.

Director Kelly Inaugurates Policy of Opening Bids in Southern California

A NEW policy in the opening of bids was inaugurated by Director Earl Lee Kelly on May 17th, when he opened bids for highway construction in southern counties at the State Building in Los Angeles.

The occasion brought out a large attendance of representatives of the construction industry and civic bodies in southern California who applauded Mr. Kelly's change of policy. Heretofore all bids for highway work have been opened in the headquarters building at Sacramento.

OFFICIAL PARTY—Standing, left to right: R. H. Wilson, J. G. Standley, F. J. Connolly, John C. Austin, Glen V. Slater and C. C. Carleton. Front row, seated, left to right: S. V. Cortelyou, George T. McCoy, Earl Lee Kelly and Philip A. Stanton.

The initial bid opening in the south took place in the large auditorium of the State Building. Eighteen bids were received and opened on two major projects in Los Angeles and Orange counties.

HANDICAP REMOVED

In a brief talk Director Kelly said that in the future it is planned to open here not only bids on southern California highway projects but also bids on all other State public works, such as buildings and similar matters of primary interest to this district.

John C. Austin, representing the Los Angeles Chamber of Commerce, and F. J. Connolly, manager of the Southern California Chapter of Associated General Contractors of America, also spoke. Austin said the former policy of opening all bids in Sacramento has worked a great handicap on southern California contractors. He commended Director Kelly for the courage displayed and said the official has made a distinct contribution to the community.

DIRECTOR COMMENDED

Mr. Connolly said Director Kelly "deserves great credit for his decision to provide this convenience for southern California business." He added the Associated General Contractors have been urging the step for several years.

Among those who participated besides those mentioned were R. H. Wilson, office engineer, State Division of Highways; Glen V. Slater, assistant State Registrar of Contractors; J. G. Standley, principal assistant engineer, State Division of Highways; S. V. Cortelyou,

DREW PACKED HOUSE—Bidders, material and bonding company representatives and interested visitors filled the large auditorium of the Los Angeles State building at the first bid opening in southern California.

district highway maintenance engineer; G. T. McCoy, assistant State Highway Engineer; Phil Stanton, Highway Commissioner, and C. C. Carlton, chief counsel of the Department of Public Works.

A telegram from Harry L. Harper, president of the Los Angeles Chamber of Commerce, expressing gratification, was also read.

In celebration of the event and to honor the director a dinner meeting will be held in the evening at the University Club by Southern California Chapter, Associated General Contractors, it is announced by Manager Connolly.

Many Improvements to Coast Highway in Santa Barbara County

THE Coast Highway in Santa Barbara County is being improved at numerous locations by important projects that share in the NIRA funds.

At Ellwood, a change of line, including the approaches to the new concrete bridge over the Southern Pacific tracks, has been completed with a 20-foot P. C. C. pavement on a 36-foot graded roadbed under the provisions of the National Industrial Recovery Act.

Between Arroyo Honda and Gaviota, a distance of 4.9 miles, the road is under reconstruction with a 20-foot reinforced P. C. C. pavement on a 36-foot graded roadbed. It is anticipated this project will be completed in August.

Between Olive Mill Road and the Santa Barbara city limits, a distance of 0.8 mile, the pavement is being widened to a 40-foot asphaltic concrete pavement on a 56-foot roadbed with 8-foot oiled earth shoulders. This project under the provisions of the National Industrial Recovery Act is through the business section of Montecito, a highly improved residential suburb of Santa Barbara.

In the city of Santa Barbara there is under construction a through-traffic boulevard, six miles in length, from the easterly city limits to a point near Hollister Avenue at the west of the city. This is a 30-foot Portland cement concrete base, with an asphaltic concrete surface, on a roadway 46- to 76-feet in width. This work is handled as two contracts, J. E. Haddock, Ltd., being the contractor on both jobs. It is anticipated that the work will be completed in November. This work also comes under the provisions of the National Industrial Recovery Act.

Passenger: "Conductor, have I time to say good-bye to my wife?"

Conductor: "I don't know, sir, how long have you been married?"

Massive Overpass Has 4 Traffic Lanes

(Continued from page 4)

artistic appearance. It replaces an old concrete bridge at times inadequate for traffic.

SUBWAY UNDER RAILROAD

Further to the northwest a crossing is made beneath the Santa Fe Railroad tracks through a subway 44 feet in clear roadway width. Its approaches are of easy gradients and the sight distance is more than a quarter of a mile. This was made possible partly by the favorable direction of surface drainage at the easterly approach, which permitted a lower grade elevation for the vertex of the vertical curve at this approach, and partly by the location at this point of earth borrow suitable for embankment and pavement subgrade. The extensive side borrow at this place gives the approach an unusual and pleasing appearance.

Still further to the north, approach ramps of easy curvature and gradients and a massive concrete and steel over-pass carry the traffic above the main line tracks of the Southern Pacific Railroad and over the present State highway, which will still be maintained as a county road, carrying the southbound traffic destined to the Kern County Airport or Oildale. Northbound traffic from these local points will later, under a proposed county development, pass around the northeasterly ramp approach and weave into the northbound main line traffic at the foot of the ramp. The northerly ramp delivers the traffic on to the tangent alignment of U. S. Route 99 near the Standard Oil tank farm.

COMPACTION STUDIES MADE

As a whole, the project required the most careful planning and scheduling of operations, in order that no contractor's work be delayed and that the whole project be opened to traffic at the earliest possible date.

Construction throughout followed the standards of the State Department of Public Works, Division of Highways, and all work was done under the inspection of the engineers of that division.

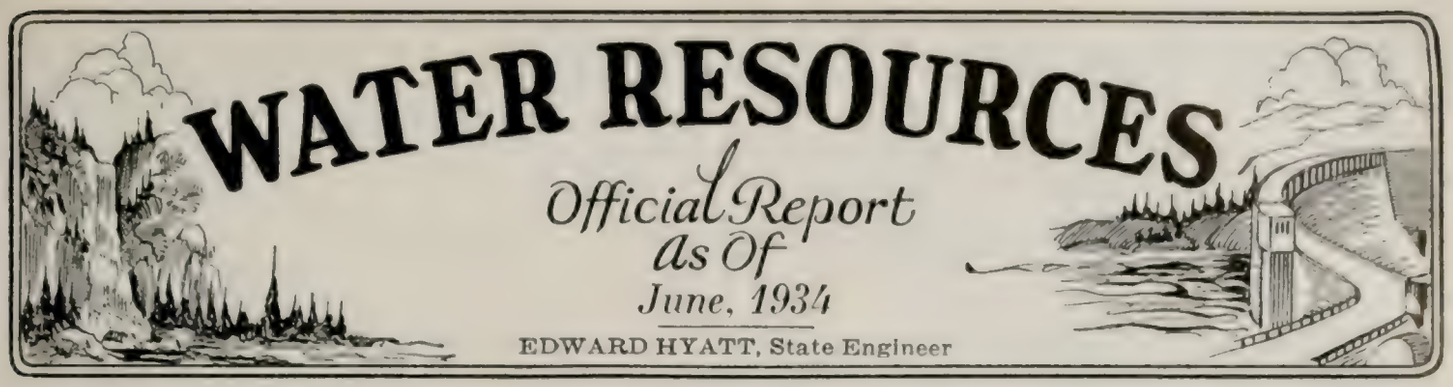
During the construction of the high embankments, which would receive pavement immediately following the completion of grading, careful studies were made to determine the relative compaction being obtained and to insure that the support by the pavement would be adequate.

MAXIMUM WETTING OBTAINED

In order to obtain the greatest service from water used the earth was wet the full depth

(Continued on page 31)

OFFICIAL DEDICATION PARTY—Left to Right: Hugh Pomeroy, Advisor of Kern County and San Mateo County Planning Commissions; W. E. Drury, Kern County Planning Commissioner; C. A. James, Engineer of Kern County Planning Commission; John W. Howe, Secretary, California Highway Commission; Stanley Abel, Kern County Supervisor; Morgan Keaton, Deputy Director of Public Works; J. R. Gist, Mayor of Bakersfield; A. E. Hoagland, President, Kern County Chamber of Commerce; W. H. Jahant, Chairman, Kern County Planning Commission; J. R. Thornton, Kern County Surveyor; L. B. Nourse, Secretary, Kern County Chamber of Commerce; Harry A. Hopkins, Chairman, California Highway Commission; Perry Brite, Supervisor Kern County; Philip A. Stanton, Member, California Highway Commission; Thomas Klipstein, Bakersfield Chamber of Commerce and Frank A. Tetley, Member, California Highway Commission.



IRRIGATION DISTRICTS

Office work on compiling and checking data for the annual report on irrigation districts was completed. This work consisted of summarizing for the year of 1933, the population, number of farms, water diverted, crops produced, assessments and collections and bond transactions for all irrigation districts.

The land owners of the Santa Clara Valley in the area lying between Morgan Hill and the Pajaro River are investigating the feasibility of organizing a conservation district for the purpose of the control and spreading of the waters of Uvas and Llagas creeks for replenishment of the ground water of the area. This highly developed section is irrigated from wells, and the recession of ground water over a large portion of the area during recent years is reported to have become alarming.

DISTRICTS SECURITIES COMMISSION

The Commission issued the following orders:

Byron-Bethany Irrigation District, Contra Costa County: Approving certification of a refunding bond issue in the amount of $569,000.

Santa Fe Irrigation District, San Diego County: Approving refunding expenditures in the amount of $5,092.90.

La Mesa, Lemon Grove and Spring Valley Irrigation District, San Diego County: Granting authority to enter into a contract with PWA for a loan and grant of $600,000.

South Fork Irrigation District, Modoc County: Approving as feasible the voting of a bond issue of $165,000 to be used in support of a loan from PWA of a like amount.

Lindsay-Strathmore Irrigation District, Tulare County: Approving of agreement with Packwood Canal Co., relative to certain water rights; also agreement with Farmers Ditch Co., relative to the transfer of stock.

Palo Verde Irrigation District, Riverside County: Approving refunding plan.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

A small force has been carrying on routine maintenance work on levees, structures, canals, etc., in Sutter County. A small force has also been engaged in fire guard work, removing dry vegetation in the vicinity of bridges and timber structures.

Sacramento Flood Control Project—Bank Protection.

The U. S. Engineer office at Sacramento has continued work under the State-Federal cooperative program for permanent bank protection, in Reclamation District No. 108 and Reclamation District No. 1500.

Sacramento Flood Control Project.

The Reclamation Board has requested this Department to raise and move certain buildings and improvements on the property of W. D. De Jarnatt in connection with the construction of the levee on the left bank of the Sacramento River below Colusa, at an approximate cost of $4,000.

Flood Measurements and Gages.

No work other than routine maintenance of stations and gages was performed during this period, and the operation of certain gages maintained for flood purposes only was discontinued on May 1st. The collection and arrangement of flood data have been continued.

WATER RIGHTS

Supervision of Appropriation of Water.

Thirty-five applications to appropriate water were received during the month of April; 10 were denied and 15 were approved. In the same period 8 permits were revoked and 21 passed to license.

Among the more important applications which were approved during the month was one by Pacheco Pass Water District of Hollister wherein appropriations were allowed from Pacheco Creek for the irrigation of some 9600 acres at an estimated cost of $200,000.

Projects covered by permits of this office situated in Santa Clara, Santa Cruz, San Benito, Monterey, San Luis Obispo, Santa Barbara, Los Angeles, Orange, San Bernardino, Riverside, San Diego and Inyo counties were inspected during the month of April.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

In continuation of its endeavor to secure subscriptions from the water users to match available State funds so that the water supervision might be reestablished and carried on through the 1934 season, the Permanent Committee of the Sacramento-San Joaquin

(Continued on page 26)

"Roughograph" Invented by Engineers to Locate Bumps on New Pavements

By **E. L. SEITZ**, Resident Engineer, District VII

THE riding qualities of hard surfaced pavements have been greatly improved during the past several years and there exists, among the different engineering crews, considerable rivalry in obtaining a record job for smoothness of the finished pavement.

Much has been done in the way of mechanical spreaders and finishers to insure an even distribution of surfacing materials, but there still remains the problem of locating and marking the minor inequalities which inevitably occur under accepted construction methods. This is especially true in the case of asphalt concrete pavement, where the smaller "bumps" must be found and outlined in order that they may be ironed out by cross-rolling.

OLD METHOD LABORIOUS

A usual method of locating bumps is by means of a five-foot straightedge, the operator stooping over and laboriously straightedging and marking the entire area of the pavement. His labors were considerably lessened when the resident engineer allowed a rigid handle to be attached to the straightedge and the assistant assigned to that disagreeable task might walk upon his hind legs instead of creeping about on all fours.

But the engineering assistant who is up and coming is not satisfied with one small improvement. Numerous devices have been tried out which would indicate the presence of a bump by watching an indicator or a recording stylus as the device was slid or wheeled along the pavement surface.

Credit is due to Harry D. Johnson, assistant resident engineer on contract 67UCL road VII-L.A-4-A, 5.1 miles asphalt pavement project between Santa Clara River and Castaic school, for working out the principle of the so-called "Roughograph," which not only finds the bumps but automatically marks their location on the pavement. Mr. Johnson was ably assisted by his co-worker, V. A. Miller, in working out the mechanical details of this device and one rainy afternoon when a lull occurred in paving operations, a crude affair was constructed, using miscellaneous lumber and hardware.

SIMPLE CONSTRUCTION

The original machine consisted of a frame five feet in length with a runner at each end and a third runner, set at the mid point of the frame, connected by means of a compound lever to a crayon marker set immediately behind the third runner. The compound lever was so arranged that a slight upward movement of the third runner caused the crayon marker to move downward, the movement of the crayon being several times greater than that of the runner; a ratio of 4 : 1 between the crayon and the runner was found to be satisfactory. The runners showed considerable wear after several hours use and small wheels were substituted, a second wheel being placed at the forward end to allow the machine to stand alone.

The "Roughograph" is wheeled longitudinally along the pavement surface and as it passes over a bump the middle wheel is raised in respect to the supporting wheels at either end of the frame. The marker crayon is moved downward so as to bear against the pavement surface and leave a mark.

Since the wheel and crayon are set adjacent to one another the mid point of the mark is also the mid point of the bump. By wheeling the "Roughograph" over the pavement on paths two or three feet apart all of the bumps are marked, with the marks running longitudinally along the pavement, and if desirable, cross marks can then be made on each bump. The accompanying photograph shows a section of pavement after being so marked.

The original machine being of rather crude construction, it was decided to have one built more substantially, and accordingly plans of the "Roughograph" were turned over to W. B. Cannon, superintendent of equipment at Shop 7. The crayon marker required constant adjustment to compensate for wear, and to eliminate this feature, details of a device to use a fluid instead of a crayon for marking were worked out and a machine built that would leave one, two or three marks, according to the height of each bump.

CROSSES MARK THE SPOTS where the "Roughograph" has detected high places in the newly laid asphalt concrete pavement which will be ironed out by cross-rolling.

FIRST "ROUGHOGRAPH" built by the inventor, Assistant Resident Engineer Harry D. Johnson, of District VII. The five-foot timber frame carries a crayon marker actuated by a runner set at mid point of the frame.

Summer Water Supply Outlook Bad

(Continued from page 23)

River Problems Conference sent out a further appeal on May 1st. Further subscriptions have been coming in and the Committee is hopeful the funds will soon be sufficient that the work can be under way.

The advance of the season has brought no reason to modify the estimate of April 1st, that summer water supply conditions will approach closely those of the dry seasons of 1924 and 1931. On May 15, 1934, the flow of the Sacramento River at Sacramento was about 5700 second-feet, corresponding to a flow on the same date in 1931 of 4000 second-feet. The flow of the San Joaquin River near Vernalis was down to about 600 second-feet early in May.

Salinity sampling is being maintained at three points only and the establishment and maintenance of the usual program of salinity sampling in the delta is contingent upon the success of the efforts of the Permanent Committee to secure sufficient funds to start the Water Supervisor work. The following shows the result of tests of samples taken at the three stations on May 14, 1934, compared to the corresponding salinity on May 14, 1931.

Salinity—May 14th

Salinity in parts of chlorine per 100,000 parts of water

	1931	*1934*
Bullshead	870	820
Antioch	90	21
Collinsville	150	35

DAMS

Application for the construction of the Del Rio Woods Dam in Sonoma County was filed on April 19, 1934. The proposed dam will be a timber flashboard structure located on the Russian River about 2½ miles easterly from Healdsburg. The dam will be approximately 6½ feet in height and store approximately 70 acre-feet of water for recreation purposes. This application was approved by the State Engineer on April 30th.

Application was filed on May 5, 1934, for the enlargement of the Boca Dam on the Little Truckee River near Truckee. The existing structure is a concrete gravity type of dam originally 26 feet high, the crest of which had been lowered by the owner to an extent such that it was no longer within the jurisdiction of the department. The proposed enlargement contemplates the construction of a timber section within the lowered portion of crest of the dam and the storage of approximately 800 acre-feet of water for municipal and domestic purposes.

Application for the alteration of Lake Temescal Dam of the East Bay Municipal Utility District in Alameda County was filed on May 2, 1934. The proposed work will provide drainage at the downstream toe. This application was approved by the State Engineer on May 12, 1934.

An application for repair of the Lower Loberts Reservoir, located in Modoc County, was filed on May 2, 1934, and contemplates work to increase the wasting capacity of the structure. This application was approved by the State Engineer on May 17, 1934.

The city of San Diego recently let the contract for the extension to the spillway channel at the El Capitan Dam and work is now in progress.

Office studies are under way on the revised plans for the construction of the Verdugo Wash Dam of the Los Angeles County Flood Control District.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Vertical controls were run during April on Paynes Creek Quadrangle in Shasta and Tehama counties and drafting in connection with the revision of Colfax Quadrangle in Nevada and Placer counties was completed.

Topographic mapping of Dudley No. 2 Quadrangle in Fresno and Kings counties has been completed and the topographic mapping in Parkfield No. 1 Quadrangle in Fresno, Monterey and Kings counties is in progress.

Advance sheets of a revision of the Truckee Quadrangle sheet are now available as are also final sheets of the La Cima Quadrangle sheet in Fresno and Kings counties.

WATER RESOURCES

Ventura County Investigation.

The report on the Ventura County Investigation, Bulletin No. 46 of the Division of Water Resources, came from press during the month. This investigation started in 1927 and was concluded in the fall of 1932. It resulted in a general evaluation of the water supply of Ventura County as compared to the present and future demands upon it and a plan for future development. It was financed jointly by the county of Ventura and the State of California.

South Coastal Basin Investigation.

The South Coastal Basin Investigation continued during the month, efforts being centered on the annual mimeographed report of water levels in the basin and on the hydrological data, also on the forthcoming geological report.

VENTURA-MARICOPA HIGHWAY AGAIN OPEN

All slides caused by heavy winter rains have been removed from the Ventura-Maricopa Highway and the road is now entirely open. This new 85-mile highway extending from Ventura via Ojai Valley and Wheeler's Hot Springs north to Maricopa was officially dedicated on October 22 of last year. It offers a more direct north-south route from the San Joaquin Valley west side to the Ventura coast.

Head Cook: "Didn't I tell you to notice when the soup boiled over?"

Assistant: "I did. It was half past ten."

ANOTHER WORLD'S RECORD is represented by Pier W-6 of the Bay Bridge, located 1160 feet west of Yerba Buena Island; the first pier ever built and completed by the compressed-air-flotation caisson method.

Submarine Battle of Bay Bridge Won

THE submarine battle, major engagement in the campaign to build a bridge over the broad bosom of San Francisco Bay, has been won. It was the unknown underwater region, between the surface of the bay and bedrock, that made the people of San Francisco and Oakland say for years it was impossible to bridge the bay.

Of course, long before the start of the building of the bridge, the bay bottom was punched by diamond drillers, so that the profile of the bedrock has been wholly known to the engineers both as to depth and quality, but these borings revealed that the bedrock is deeper than any piers have been sunk heretofore. This depth and the deep, swift tides made the substructure the major engagement in the building of the great bridge.

CONTRACTORS GAMBLED MILLIONS

Methods were designed by Chief Engineer C. H. Purcell and his staff by which the contractors were to conquer the deep water and deep rock, in order to make foundations for the bridge towers, and when State Director of Public Works Earl Lee Kelly awarded contracts to the low bidders, it took bold contractors, with complete faith in Chief Engineer Purcell and his staff, to accept the job of sinking piers by new methods, far deeper than any piers had ever been sunk before by any methods.

The contractors gambled millions of dollars on their belief in the State's engineering designs.

Now, all the deep piers of the San Francisco-Oakland Bay Bridge have been sunk to final elevation save one, E-3, 1400 feet east of Yerba Buena Island, which is even now more than half way to its final placement.

World-wide engineering interest was attracted by the West Bay piers of the bridge, which were sunk by the compressed-air-flotation caisson method, adapted by Chief Engineer Purcell's staff from an original design by the granddaddy of foundation engineering, Daniel E. Moran of New York City.

All of these compressed-air-flotation caissons, which are distinguished by their cylindrical dredging wells, and which are domed during the floating stage, are now either sealed or being sealed to rock, which means that a concrete floor has been poured on the cleaned-off rock after the caisson was stopped, with its bottom 10 feet above rock, and the pouring begun down the dredging wells to build that floor ten feet or more thick with columns of concrete extending up each well at least 30 feet.

Dams Not Necessary to Conserve Ventura County Water Supply

DIRECTOR Earl Lee Kelly announces the release by Edward Hyatt, State Engineer, of Bulletin 46, "Ventura County Investigation," by Harold Conkling, Deputy State Engineer. The bulletin contains 244 pages, 94 tables and 55 plates, of which some are colored.

The investigation covered five full years and was financed jointly by the State and Ventura County. A specially intensive investigation of reservoir sites on Piru Creek was made because of conflict over the occupancy of two sites by the relocated Los Angeles-Bakersfield highway. This portion of the investigation was financed largely by the Division of Highways.

DAMS NOT NECESSARY

The bulletin represents the conclusions from a vast amount of data gathered concerning the hydrology and geology of the county. The obvious method for conserving water is by construction of reservoirs in the headwaters but the conclusions from this study indicate that water in Ventura County can be conserved in other ways at a fraction of reservoir cost. Principal conclusions as to water supply for rainfall such as has occurred in the past 40 years are as follows:

1. No shortage of water present or prospective is possible in Santa Clara Valley proper.

2 A slight shortage may exist in Oxnard Plain and intrustion of saline water from the ocean may threaten.

3. A shortage may exist in part of Simi Valley and Pleasant Valley.

4. No shortage exists in Las Posas Valley.

5. Probably no shortage exists in Ojai Basin or upper Ventura River Basin.

6. Ventura City has four possibilities for increasing water supply: 1. Construction of a reservoir on Santa Ana Creek. 2. Improvement of Upper Ventura River Basin. 3. Pumping near the mouth of Ventura River. 4. Pumping in the vicinity of the mouth of Santa Clara River.

KILL WILLOWS, SAVE WATER

The cheapest means of amplifying the supply to Oxnard Plain is by spreading the floods of Santa Clara River on the south side in the vicinity of Saticoy. The cheapest means of amplifying the supply to Pleasant Valley is by a canal passing around the west end of South Mountain and fed by pumping from the lower end of Santa Clara Valley.

It is estimated that the willows along Santa Clara River are wasting 12,000 acre feet of water annually to keep them alive. Pumping in this area would lower the water table, kill the willows and thus make this waste available for beneficial use besides creating underground capacity into which the river floods would percolate and thus in part be salvaged.

Reservoirs in the mountains are extremely expensive at sites investigated. The estimated capital cost per acre-foot for conserving water during a ten-year dry period such as that beginning 1922 varies from $455 to $730 at various sites on Piru Creek; $224 to $366 on Sespe Creek and $390 to $480 on Ventura River. As compared to this the estimated capital cost of spreading is $28 per acre-foot at works near Saticoy.

Except for Ventura City and the possible intrusion of salt water into Oxnard Basin, both of which situations can be easily remedied, the situation as to water supply does not call for construction at this time.

If and when reservoirs become necessary, the cheapest are found on Sespe Creek while those on Piru Creek are the most expensive.

ALL IN THE DAY'S WORK FOR THE HIGHWAY FOREMAN

Department of Natural Resources
Division of Forestry
Sacramento

Mr. E. E. Wallace,
District Engineer,
State Division of Highways,
San Diego, California.

Dear Mr. Wallace:

I wish to take this opportunity of expressing our appreciation of the cooperation extended to the State Division of Forestry, by your foreman, Mr. Cummings, at Julian, during the recent Banner Grade fire.

He extended to us every possible courtesy, and was of material assistance to us by keeping the Banner Grade cleared of debris so that our equipment could travel the road with safety.

He also made available all facilities around the maintenance station and carried many messages for us.

We also appreciate the closing of the road to public travel during the worst part of the fire as it stopped any possibility of a traffic jam on the road when our equipment was being used suppressing the fire and at the same time probably prevented the loss of life, as the road was not safe to travel on several occasions.

Very truly yours,

L. C. GORDON,
State Forest Ranger.

By J. A. Graves,
Fire Chief.

INDUSTRIES FEEL LOSS OF HIGHLY TRAINED MEN

"One of the unexpected results of the depression years," says Ralph E. Weeks, president of a correspondence school, "is that now when an industry urgently needs its highly skilled men, in many cases it finds there are not enough to fill the demand. Many of the older men have passed beyond the active age or have died. Others have drifted off to other localities or into other ways of making a living. The farm has claimed not a few. The problem of training a new generation of skilled workers is likely to become increasingly acute as industrial activity gains acceleration."

One Hundred Men Employed Daily in Building Overpass

(Continued from page 14)

Thanks to the splendid cooperation of the city of Los Angeles, which prepared the plans for the structure, the Pacific Electric Railway Company, which conducted its track and trolley movement without delay, the public utilities, who have promptly shifted their various utilities, wires and pipe lines, the property owners and traveling public, who have been temporarily inconvenienced, the contractor, the Federal employment agency and various Federal authorities interested in financing the work and in the quality of construction, the job is progressing smoothly and the structure is rapidly taking shape. At times there have been over one hundred men daily employed on construction work.

Mr. Paul Watson, representing the State, is supervising the work of construction. The cost of the project will be approximately $130,000.

To install the huge bridge has involved 6000 yards of excavation. Into this makeup goes 3796 yards of different classes of concrete and 808,000 pounds of reinforcing steel. It calls for 730 tons of asphaltic concrete paving and 11,560 linear feet of reinforced concrete.

"Every minute of time saved for thousands of persons journeying along those boulevards is of tremendous economic importance to the entire city," says the *Los Angeles Times.*

"Thus the new structure will further the welfare of the expanding regions that stretch out toward and beyond the western reaches of the city, Hollywood, Glendale. By the same token it has its large place in providing more convenient accessibility into a large and very important section of the downtown areas."

FOREST FIRE HAZARD SERIOUS

Motorists and outing devotees are urged by the U. S. Forest Service to exercise the utmost care this year in the use of fire in California's many wooded areas.

This State is faced with one of the longest and most serious fire hazards in years, we are warned by the service, due largely to a precipitation last winter only 69 per cent of normal, coupled with the highest spring temperatures on record, and an advanced season.

General orders were issued by Regional Forester S. B. Show, effective May 15, regarding smoking, discharging fireworks, camp fire permits, closure of areas to public use, and carrying shovel and ax in Federal forests.

In Memoriam

LYLE M. RANSON, one of the most beloved and highly esteemed employees of District VII of the State Division of Highways, passed away from heart trouble at 7 a.m., May 28th, at Los Angeles.

Mr. Ranson entered the State's service February 10, 1913, and was employed by the State continuously from that date as Draftsman, Assistant Resident Engineer, Resident Engineer, Assistant Division Engineer, Associate Highway Engineer and Senior Highway Engineer. He had been District Construction Engineer in District VII for the last ten years. During that time he had charge of the construction of many of the largest highway projects in southern California.

His education was received at the University of West Virginia. After completing three years in the University, he enlisted in the First West Virginia Infantry in the Spanish American War. At the close of the war, he entered the employ of the American Steamship lines as Engineer Cadet, after which he was employed in various engineering capacities with several railroad companies until 1912. During 1912 and early 1913 he was engaged in surveying for power development on the Isthmus of Panama. Following this he began his twenty-one years of continuous service with the State Division of Highways.

All who came in contact with Mr. Ranson had the highest regard for him both personally and professionally and his many promotions show that his efficient service was fully appreciated by the heads of his department.

Mr. Ranson is survived by his widow, Grace Ranson; his father, Dr. B. B. Ranson, of West Virginia; a brother, Dr. B. B. Ranson, Jr., of New York City; and a sister who resides in Japan.

HALVOR THORSON REESE, aged 68, retired employee of District VII of the Division of Highways, died at Los Angeles on May 11, 1934. Mr. Reese began work with the Division of Highways in 1918 and until his retirement in 1933 was a loyal and efficient employee.

He was born in Norway, coming to the United States at the age of seventeen, and lived in California twenty-seven years.

He is survived by his widow, four daughters and one son, all residents of Los Angeles.

Inhabitants of the Island of Crete built a road about 1500 B.C., that is still in such condition that an automobile may be driven over it as fast as 60 miles an hour, according to a recently published report.

Highway Bids and Awards

FOR MAY

ALAMEDA COUNTY—Between San Leandro and Oakland, 1.1 miles to be graded and paved with asphaltic concrete or Portland cement concrete. District IV, Route 5, Section D. United Contracting Company, Portland, Ore., $110,982; Hanrahan Company, San Francisco, $114,814. Contract awarded to Heafey-Moore Co., $110,275.

FRESNO AND TULARE COUNTIES—Between Orange Cove Rd. and Gen. Grant National Park and between Academy and East end Huntington Lake, 87.0 miles to be treated with fuel oil. District VI, Routes 41, 76, Sections T, U, A, B, C, D, E. Oilfields Trucking Co., Bakersfield, $37,950; Stewart & Nuss, Inc., Fresno, $40,835. Contract awarded to C. W. Wood & L. C. Pulley, Stockton, $36,818.

FRESNO COUNTY—Between Tulare Street and Stanislaus Street, about 0.5 miles in length to be graded and asphaltic concrete paved. District VI, Route 4. Valley Paving & Construction Co., Fresno, $36,496. Contract awarded to Union Paving Co., San Francisco, $35,159.

INYO COUNTY—Between one mile west of Lone Pine and the East End of Zinc Hill Grade, about 32.9 miles to be treated with fuel oil. District IX, Route, 127, Sections B, C, D, E, and F. Tiffany Construction Co., San Jose, $9,657; Pacific Tank Lines, Inc., Los Angeles, $9,462; Gilmore Oil Co., Los Angeles, $9,303; Paulsen & March, Inc., Los Angeles, $8,062; Square Oil Co., Inc., Los Angeles, $8,151. Contract awarded to C. W. Wood and L. C. Pulley, Long Beach, $7,442.

INYO COUNTY—Between So. Sierras Power Plant No. 4 and Camp Sabrina, about 10.8 miles to be treated with fuel oil. District IX, Route 76, Section B. Paulsen & March, Inc., Los Angeles, $2,973; Gilmore Oil Co., Ltd., $2,346. Contract awarded to C. W. Wood and L. C. Pulley, Long Beach, $2,004.

INYO COUNTY—Between East boundary of Death Valley National Monument and Death Valley Junction, about 18.3 miles to be treated with fuel oil. District IX, Route 127, Sections L and M. Tiffany Construction Co., San Jose, $5,412; Pacific Tank Lines, Inc., Los Angeles, $5,412; Gilmore Oil Co., Los Angeles, $5,699; Paulsen & March, Inc., Los Angeles, $5,268. Contract awarded to Square Oil Co., Inc., Los Angeles, $3,842.

KERN COUNTY—Between Haypress Canyon and Bear Mountain Ranch, about 6.3 miles in length to be graded. District VI, Route 58, Section D. Griffith Company, Los Angeles, $115,311; Union Paving Co., San Francisco, $118,886; Morrison-Knudsen Company, Los Angeles, $147,295; J. F. Knapp, Oakland, $108,410; Gibbons & Reed Company, Burbank, $111,013; Dimmitt and Taylor, Los Angeles, $122,914; Sharp and Fellows Contracting Co., Los Angeles, $121,882; Peninsula Paving Company, San Francisco, $151,970. Contract awarded to Contoules Const. Co., San Francisco, $106,883.

KERN COUNTY—Between Westerly Boundary and 6.6 miles west of McKittrick and between the junction of Route 58 and Route 144 and State Institution for Women, 15.8 miles to be treated with fuel oil. District VI, Routes 58, 144, Sections H, I and A. Geo. K. Thompson, Los Angeles, $16,940; John Jurkovich, Fresno, $15,600. Contract awarded to C. W. Wood and L. C. Pulley, Stockton, $15,576.

KERN COUNTY—Between Mojave and 7 miles northwesterly. About 7 miles to be treated with asphalt road oil. District IX, Route 58, Section G. Pacific Tank Lines, Inc., Los Angeles, $2,536; Gilmore Oil Co., Los Angeles, $2,156; Paulsen & March, Inc., Los Angeles, 2,014; Square Oil Co., Inc., Los Angeles, $3,087. Contract awarded to C. W. Wood and L. C. Pulley, Long Beach, $1,833.

LAKE COUNTY—In Lake County between Middletown and Lower Lake road. About 20.2 miles to be treated with fuel oil. District I, Route 89, Sections B and C. Melvin W. Prather, Lakeport, $6,131; C. F. Fredericksen & Sons, Lower Lake, $5,652; Chas. Kuppinger, Lakeport, $4,960; Helwig Constr. Co., Sebastopol, $6,384. Contract awarded to Basalt Rock Co., Napa, $4,827.

LASSEN AND MODOC COUNTIES—Between Litchfield and Alturas, about 92.2 miles to be treated with fuel oil. District II, Route 73, Sections C, D, E, F, G, C and D. Tiffany Constr. Co., San Jose, $25,411; Pacific Truck Service, San Jose, $26,341; Oilfields Trucking Co., Bakersfield, $27,374; Peninsula Paving Co., San Francisco, $27,374; Basalt Rock Co., Inc., Napa, $24,792. Contract awarded to C. F. Fredericksen & Sons, Lower Lake, $23,862.

LOS ANGELES COUNTY—Between Redondo Beach and Wilmington, about 5 miles to be graded and paved with asphaltic concrete or Portland cement concrete. District VII, Route 60, Sections D-Tor. Griffith Company, Los Angeles, $319,235; J. L. McClain, Los Angeles, $303,661; Union Paving Co., San Francisco, $334,828; Sully-Miller Contracting Co. and Kovacevich and Price, Inc., Southgate, $305,505; Basich Brothers, Torrance, $301,809; Oswald Bros., Los Angeles, $324,429; Jahn & Bressi Constr. Co., Inc., Los Angeles, $323,587; Sharp and Fellows Constr. Co., Los Angeles, $320,271. Contract awarded to United Concrete Pipe Corporation, Los Angeles, $293,563.

LOS ANGELES AND ORANGE COUNTIES—7.9 miles to be graded and paved with asphaltic concrete or Portland cement concrete. District VII, Route 174, Sections B, A. P. J. Akmadzich, Los Angeles, $296,772; Oswald Bros., Los Angeles, $247,048; Basich Bros., Torrance, $236,101; Jahn and Bressi Const. Co., Inc., Los Angeles, $281,562; Los Angeles Paving Co., Inc., Los Angeles, $246,368; Griffith Company, Los Angeles, $239,951; Union Paving Company, San Francisco, $282,244. Contract awarded to United Concrete Pipe Corp., Los Angeles, $234,247.

MARIN COUNTY—Between Stinson Beach and Marshall, about 14.6 miles in length, apply bituminous surface treatment and asphalt seal coating. District IV, Route 56, Sections B, C. Pacific Truck Service, Incorporated, San Jose, $29,981; A. J. Raisch, San Jose, $36,967; E. A. Forde, San Anselmo, $29, 774. Contract awarded to Lee J. Immel, Berkeley, $26,831.

MENDOCINO COUNTY—Between Gualala and Mendocino City, 51.1 miles to be treated with fuel oil. District I, Route 56, Sections A, B, C and D. Basalt Rock Co., Inc., Napa, $17,609; Helwig Const. Co., Sebastopol, $16,629. Contract awarded to Charles Kuppinger, Lakeport, $16,055.

MODOC COUNTY—Between Lakeview Road and Cedarville, about 2.7 miles in length, to be graded and surfaced with crushed gravel or stone. District II, Route 28, Section C. Biasotti-Willard and Biasotti, Stockton, $110,696. Contract awarded to Larsen Brothers, Sacramento, $77,881.

MONTEREY COUNTY—56-I, 2.6 miles, fuel oil to be applied and mixed on existing shoulders; Mon-118-A, 7.6 miles; and Mon-56-J, 11.3 miles fuel oil dust palliative to be applied to existing shoulders. District V, Routes 56, 118, Sections I, J, A. Walter B. Roselip, San Luis Obispo, $5,427; L. A. Brisco, Arroyo Grande, $6,409. Contract awarded to Granite Constr. Co., Ltd., Watsonville, $5,137.

MONTEREY COUNTY—King City to San Ardo, a distance of 15.1 miles, fuel oil to be applied as dust palliative to shoulders each side existing pavement. District V, Route 2, Sections F and G. Oilfields Trucking Co., Bakersfield, $3,048; L. A. Brisco, Arroyo Grande, $2,019; Granite Constr. Co., Ltd., Watsonville, $2,070. Contract awarded to Walter B. Roselip, San Luis Obispo, $2,019.

NEVADA AND SIERRA COUNTIES—Treating with fuel oil in Nevada and Sierra counties between Truckee and Hobart Mills, Sierraville and Calpine, Sierra City and Junction of Routes 25 and 83. District III, Routes 25 and 83, Sections A and B, B and C. C. F. Fredericksen & Son, Lower Lake, $8,883. Contract awarded to Tiffany Construction Co., San Jose, $8,829.

ORANGE COUNTY—Between Newport and Dana Pt., between Doheny Park and Gallivan, between Irvine and Tustin—about 26.5 miles to be treated with bituminous seal coat. District VII, Routes 60 and 2, Sections A, B, C and A, C. Kovacevich & Price, Inc., South Gate, $15,377; Matich Bros., Elsinore, $16,523; Griffith Co., Los Angeles, $16,660; Miracle Co., San Diego, $17,936; Sully-Miller Contr. Co., Long Beach, $18,980. Contract awarded to Gogo & Rados, Los Angeles, $13,397.

PLACER COUNTY—Bridge in Placer County 2.7 miles south of Tahoe City across Ward Creek. Dis-

(Continued on page 32)

Traffic Circle in Bakersfield By-Pass

(Continued from page 22)

in the borrow pit by pumping water into dikes, testing results with soil auger and controlling water used to the percentage estimated to give maximum compaction when placed.

This prior wetting tended toward compaction being obtained, beginning with the first spreading of material by caterpillar drawn scraper and increasing with each rolling and with every trip of the trucks loaded or empty. In spite of the fact that spreading and rolling followed usual standards and were entirely satisfactory, it was definitely proven that the additional compaction resulting from the truck haul over the rolled surface was very noticeable.

Throughout the project the same general type of construction was followed, viz, a 46-foot roadbed with berms on fills; standard subgrading specifications; 30 feet of asphaltic concrete pavement of 9″-7″-9″ section, laid in three courses, base, leveling course, and surface, with borders 3 feet x 6 inches composed of crushed rock, 1 inch to dust, plant mixed with about 3.9 per cent "E" grade asphalt, cut back with 13 per cent of kerosene solvent; shoulders, berms and sandy cuts oiled with pipe line run oil. Sandy cuts were constructed on 1½ to 1 slopes and oiled to prevent ravel.

GUTTERS PAVED ON GRADES

Throughout the subway cut constructed through a sandy soil, sometimes consisting of clean channel sand, it was necessary to pave the gutters where on grades in order that wash be prevented. Cut back mix was placed 3 inches thick and 2½ feet wide and rolled transversely with a tandem roller. This cross rolling, under careful control, developed an evenly dipped cross-section for the gutter with little extra hand work.

The traffic circle on Chester Avenue was particularly desired by the Planning Commission of Kern County and has proven to be a decided asset to the road in segregating, from through traffic, the traffic to and from the airport, Oildale and Bakersfield. The central area is bounded by a curb following a circle of 278 feet in diameter. This area is being prepared for landscaping.

The paved portion of the circle is 42 feet wide. The surface of this pavement is superelevated to favor, as far as possible, the main line traffic, but warps from this superelevation to a modified and variable cross-section as the outer lane approaches an intersecting street which delivers or receives traffic with such easy turn over profiles that a car traveling at 25 miles per hour is not at all inconvenienced.

CIRCLE DRAINAGE SYSTEM

At the same time the cross-section is such as to handle the drainage to curbside inlets or gratings flush with gutter surface. These in turn lead to silt basins, thence to sumps. In general the water is led to sumps located inside the central park area and which are dug well into coarse sand beds, backfilled to the top line of the inlet pipes with broken concrete and gravel. Above the elevation of the top of this pipe the sump is sealed over with an earth backfill, well compacted.

The arrangement of the drains and gutters is such that, should any sump fail to accommodate all of the drainage delivered to it the excess can flow by way of the gutters to other sumps and finally, if not fully subdrained at these points, would flow through a part circle culvert, to the gutters of Chester Avenue on the south and thence to the city's storm sewers.

COOPERATIVE FINANCING

The construction of the Kern River Bridge was financed from the State highway construction fund. The remaining features of the project were financed from the highway general fund. The city of Bakersfield contributed to the last named fund $8,500 of their ¼ cent gas tax fund, as cooperation toward the construction of the traffic circle, the total cost of which was $19,710.31.

The right of way through the city was obtained and cleared of buildings at the expense of Kern County. The city of Bakersfield, by agreement, guaranteed the State of California against claims due to changes of street grades and the construction of the highway.

The project, extending from Union Avenue to the Standard Oil tank farm, totals 5.24 miles, constructed at a total cost of approximately $594,982.04 and represents the most modern high standard highway construction.

Highway Bids and Awards Made During the Month of May

(Continued from page 30)

trict III, Route 38, Section A. E. T. Lesure, Oakland, $12,530; Holdener Const. Co., Sacramento, $10,091; F. H. Neilson, Orland, 11,080; Nelson & Wallace, Escalon, $11,359; J. P. Brennan, Redding, $11,308; Poulos & McEwen, Sacramento, $11,921; Johns Heilmann, San Francisco, $12,950; M. B. McGowan, Inc., San Francisco, $11,353. Contract awarded to N. R. Mayfield, Tahoe City, $9,145.

PLUMAS COUNTY—Between Rich and Quincy; between westerly boundary and Quincy; between Keddie and Chester; and between Blairsden and Sierra County line, 102.2 miles, to be treated with oil. District II, Routes 21 and 83, various sections. Tiffany Construction Co., San Jose, $25,061; Pacific Truck Service, Inc., San Jose, $27,592; Basalt Rock Co., Inc., Napa, $29,911. Contract awarded to C. F. Fredericksen & Son, Lower Lake, $23,151.

SACRAMENTO COUNTY—At the bridge across the Sacramento River about 1.3 miles North of Isleton, fenders to be constructed for two piers. District III, Route 11, Section D. Bundesen & Lauritzen and Delta Dredging Co., Pittsburg, $13,183; M. B. McGowan, Inc., San Francisco, $11,562. Contract awarded to M. A. Jenkins, Sacramento, $11,470.

SAN BERNARDINO COUNTY—Between the Dolly Varden Angling Club and South Fork of Santa Ana River, about 16.6 miles of roadbed to be treated with fuel oil. District VIII, Route 190, Sections E, F. Geo. Gardner & Sons, Redlands, $9,789. Contract awarded to Geo. Herz & Co., San Bernardino, $8,918.

SAN DIEGO COUNTY—Furnish and apply heavy fuel oil as a dust palliative between Morettis and the northerly boundary, and between Bonsall and Rincon in San Diego Co. District XI, Routes 78 and 195, Sectitons D, E, and B, C. Gilmore Oil Co., Los Angeles, $10,541; Lamb's Transfer Co., Long Beach, $9,514; Paulsen & March, Inc., Los Angeles, $10,806; Square Oil Co., Inc., Los Angeles, $10,210. Contract awarded to Morgan Bros., Huntington Park, $8,950.

SAN DIEGO COUNTY—Overhead Crossing over A. T. & S. F. Ry. near Carlsbad; 1-26′ 10½″ span, 2-30′ 7″ spans, 1-32′ span, and 1-45′ span on concrete bents to be widened. District XI, Route 2, Section B. Bodenhamer Const. Co., Oakland, $13,656; Contracting Engr., Inc., Los Angeles, $14,307; John Oberg, Los Angeles, $13,203; Oscar Oberg, Los Angeles, $14,255. Contract awarded to R. R. Bishop, Long Beach, $13,052.

SAN LUIS OBISPO COUNTY—Between 6 miles east of Morro and Atascadero Summit, about 3.2 miles in length to be graded and portions surfaced with selected material. District V, Route 125, Section A. Peninsula Paving Company, San Francisco, $125,947; Biasotti, Willard & Biasotti, Stockton, $103,041; R. E. Campbell, Long Beach, $92,758; Chas. L. Harney, San Francisco, $91,785; B. G. Carroll, San Diego, $108,382; Dimmitt & Taylor, Los Angeles, $107,691; Sharp and Fellows Contracting Co., Los Angeles, $99,687. Contract awarded to Union Paving Co., San Francisco, $78,846.

SANTA BARBARA COUNTY—Santa Barbara County, Routes 2, 149, 27.9 miles oil treatment to be applied to shoulders. District V, Routes 149, 2, Sections B-C-H-J-K-D. Contract awarded to L. A. Brisco, Arroyo Grande, $11,031.

SANTA CLARA COUNTY—Between College Avenue and Page Mill road in the city of Palo Alto, about 0.4 mile in length to be graded and Portland cement concrete paved. District IV, Route 2, Sections P and A. Union Paving Co., San Francisco, $41,703; Hanrahan Company, San Francisco, $42,958. Contract awarded to A. J. Raisch, San Jose, $41,378.

SANTA CRUZ COUNTY—Between 1 mile north of Inspiration Point and Scott's Valley, 6.7 miles to be surfaced with bituminous macadam and bituminous surface all to be placed on crusher run base. District IV, Route 5, Section B. Granite Construction Co., Ltd., Watsonville, $183,585; Healy-Tibbitts Construction Co., San Francisco, $207,750; Union Paving Co., San Francisco, $187,461; A. J. Raisch, San Jose, $212,072. Contract awarded to Hanrahan Co., San Francisco, $179,222.

SOLANO COUNTY—Between Vacaville and Northerly boundary, and between Junction of Route 101 and Route 53 and 1¾ miles south of Dixon, 30.1 miles to be treated with fuel oil and asphaltic road oil. District X, Routes 90 and 101, Sections A-A and B. A. Teichert & Son, Inc., Sacramento, $7,793; E. F. Hilliard, Sacramento, $7,246; Sheldon Oil Company, Suisun, $5,947; Lee J. Immel, Berkeley, $6,874; E. A. Forde, San Anselmo, $7,902; Peninsula Paving Co., San Francisco, $8,458. Contract awarded to Basalt Rock Co., Inc., Napa, $6,729.

SONOMA COUNTY—Between Vineburg Junction and Easterly Boundary to be surfaced with crusher run base and bituminous surface treatment, about 0.83 mile. District IV, Route 8, Section B. Helwig Constr. Co., Sebastopol, $13,459; E. A. Forde, San Anselmo, $11,732; Lee J. Immel, Berkeley, $11,796. Contract awarded to Ransome Co., Emeryville, $11,167.

SONOMA AND MENDOCINO COUNTIES—Between Cloverdale and Hopland, about 13.9 miles in length, to be surfaced with bituminous treated crushed gravel or stone (plant mixed). District IV, Route 1, Sections D, L. Basich Brothers, Torrance, $99,828; Pacific States Construction Co., San Francisco, $100,345. Contract awarded to Peninsula Paving Co., San Francisco, $99,017.

YUBA AND BUTTE COUNTIES—Repair bridges across Simmerly Slough (Yub-87 A) and Middle Honcut Creek (But-87-A). District III, Route 87, Section A-A. Contract awarded to M. A. Jenkins, Sacramento, $3,952.

In Memoriam

DANIEL MURRAY LEE, senior highway construction crew foreman in District XI, died on May 10th at Mecca, where he had gone from his home in Niland in connection with the work of grading State Route No. 187, the North Shore Highway along the Salton Sea.

Mr. Lee was born September 11, 1876, at Garrisonville, Stafford County, Virginia, and was educated at the Washington and Lee University, Lexington, Virginia. He was a direct descendant of General Robert E. Lee, the famous Southern officer. He came to California in 1897 and was employed for some years on railroad construction work in Mexico and by the Pacific Steamship Company. He was appointed as construction superintendent for the Division of Highways, Department of Public Works, on July 26, 1928, and assigned to District VI. He worked continuously as construction superintendent in Districts III, VI and XI, having charge of various projects using convict labor, until December 15, 1932, when he resigned on account of illness from heart trouble. He returned to work as senior highway construction crew foreman in District XI on December 1, 1933.

Besides his widow, Mrs. Ann Elizabeth Lee, he leaves one son, Daniel Lee, III; three brothers, Burwell Lee of Pleasanton, California, Colonel Sydney Smith Lee of the Marine Barracks at Washington, D. C., and Harry F. Lee of Goldsborough, North Carolina; and two sisters, Mrs. W. E. Pratt and Miss Edmo Lee of Fredricksburg, Virginia.

Mr. Lee had gained the respect and friendship of every man with whom he was associated in his engineering work and the sympathy of the entire department is extended to the bereaved family.

Jud Tunkins says he and his wife always think exactly alike, only she usually has first think.—*Washington Star.*

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

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EARL LEE KELLY.....Director

MORGAN KEATON.....Deputy Director

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R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

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Port of San Jose—Not appointed

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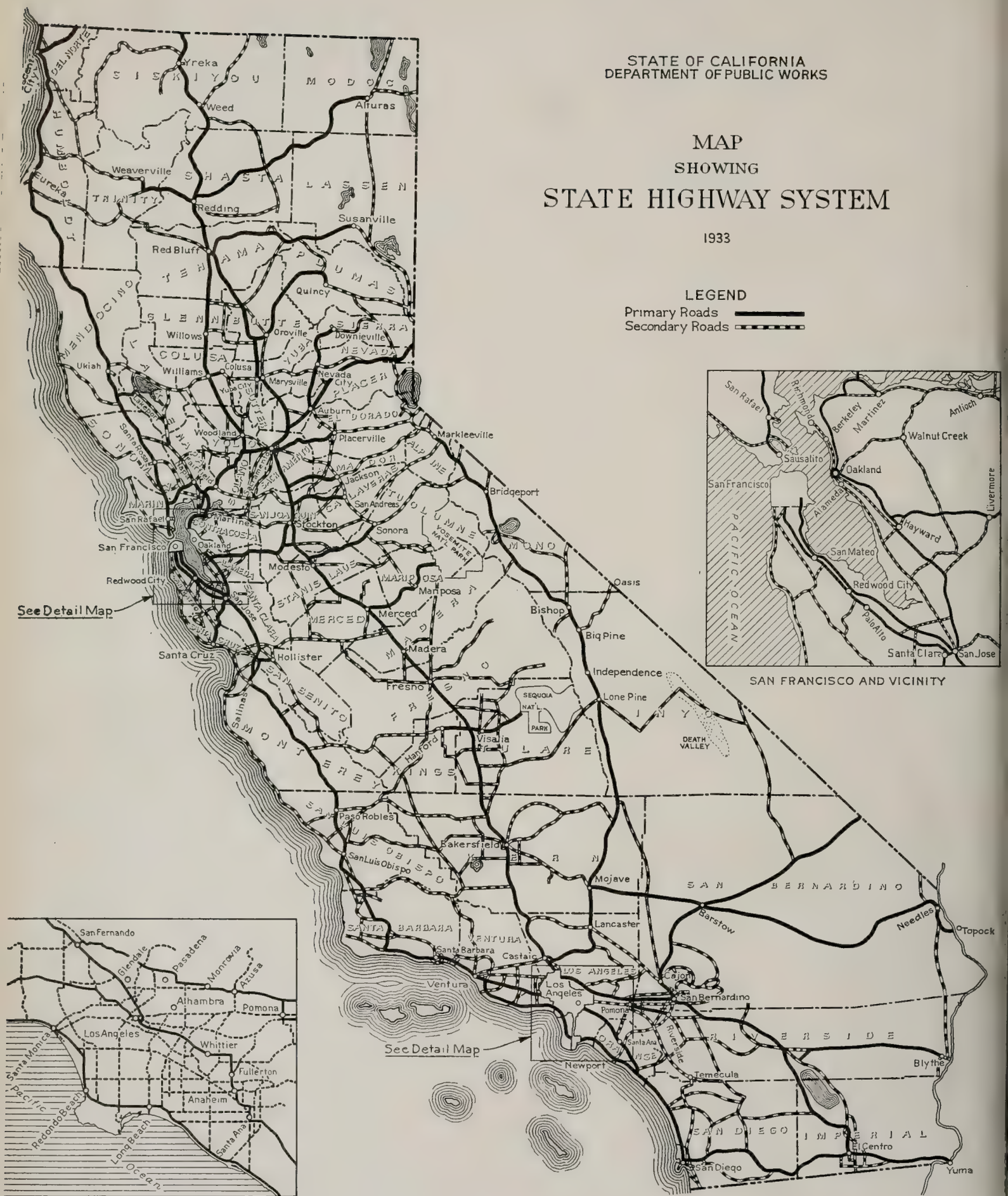
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM
1933

LEGEND
Primary Roads
Secondary Roads



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CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

Official Journal of the Department of Public Works

JULY 1934

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Governor Merriam Announces

Highway Funds Will Provide

4,510,100 Man-Days Work

During This Fiscal Year

By **FRANK F. MERRIAM**, Governor of California

IN THE expenditure of public funds under present economic conditions, first consideration must be given to the relief of the unemployment situation as the foundation stone of any program for the revival of prosperity in California.

Employment for men out of work who are willing and anxious to work for wages that will provide a decent living for themselves and their families has been recognized by President Roosevelt as the basic principle of his national recovery policy and with his views in this respect, as I have repeatedly said, I am in full accord.

During the past four years it has been the experience of the Federal government and of our own State government that no kind of relief employment gives more satisfactory results than highway work, both from the standpoint of value received and the wide spread of pay roll moneys to workers and dependents in every part of the State.

FRANK F. MERRIAM

It has been established through careful statistical studies of research experts confirmed by Federal and State checks of contract work that 90 per cent of the highway dollar ultimately goes into the pockets of labor.

It therefore gives me great joy to be able to announce that within the present fiscal year, which began July 1 and will end June 30, 1935, the Division of Highways of the Department of Public Works will expend some $18,200,000 of Federal and State funds for construction and $6,972,600 for maintenance work on our highways, thereby providing approximately 4,510,100 man-days work to citizens of California for the support of their families and dependents, with the resultant spread of benefits to the business communities in which they live.

This cheering announcement is made possible through the recent appropriation by Congress of $200,000,000 for emergency construction of public highways and other related projects throughout the Nation, of which California's apportionment is $7,932,206. The other State funds going to make up the $18,200,000 total for this fiscal year include the unexpended balance of the current biennial highway budget.

While this $7,932,206 Federal grant is an outright gift to the State, the uses to which it may be put are controlled by the act itself as well as by certain provisions of the Industrial Recovery Act.

Under these provisions 50 per cent of the grant must be used on Federal-aid high-

(Continued on page 10)

JUL 24 19

Angeles Crest Highway Will Open Vast Recreational Mountain Area in Fall

By **S V. CORTELYOU,** District Engineer, District VII

THE FOURTH grading contract on the new Angeles Crest Highway, in the mountains north of Pasadena, has been in progress since early last October and is now entering its final stages of construction. It will in all probability be completed and opened to traffic the latter part of next September.

This contract is particularly important since it is the connecting link which will complete this highway to a point where it will open up and render safely accessible to public traffic a vast area of recreational territory in the high mountains of the Angeles National Forest, including Mt. Wilson.

This highway, commenced in 1929, has been built one contract at a time as money from the State gasoline tax has been made available. Ever since the first grading contract was completed in 1930, the road has "dead-ended" at the upper end of each succeeding contract.

Completion of the present contract will provide the necessary outlet so that all of the section constructed under previous contracts, as well as the one now in progress, can be utilized to the fullest extent by motorists seeking the scenic and recreational advantages of the higher mountains.

OPENS MOUNTAIN AREA

In order to obtain a thorough understanding of how the completion of a comparatively short section of highway will open up such a large area it is necessary to take into consideration the character of the country and the present means of access.

The Angeles National Forest, through which this highway will run, is an immense area of rough mountainous country lying northerly of Pasadena, Monrovia, Azusa and Glendora, a large portion of which is 4000 feet or more in altitude.

This area is potentially the largest recreational area of mountainous territory accessible from Los Angeles

From Altadena there has, for a long time, been a narrow toll road to Mt. Wilson, one of the higher mountains in this area, on which is located the famous Mt. Wilson Observatory. This is a one-way control road, very narrow and with extremely sharp curves and steep grades.

From Mt. Wilson a narrow road has been constructed by Los Angeles County and the U. S. Forest Service via Red Box, Barley Flat and Chilao Flat to Buckhorn Flat, a distance of about 26 miles. This road passes through the city of Pasadena playground and extends into the heart of the Angeles National Forest. Owing to the fact that the only present means of access to the road through this scenic country is over the steep, narrow toll road from Altadena to Mt. Wilson, comparatively few people use it.

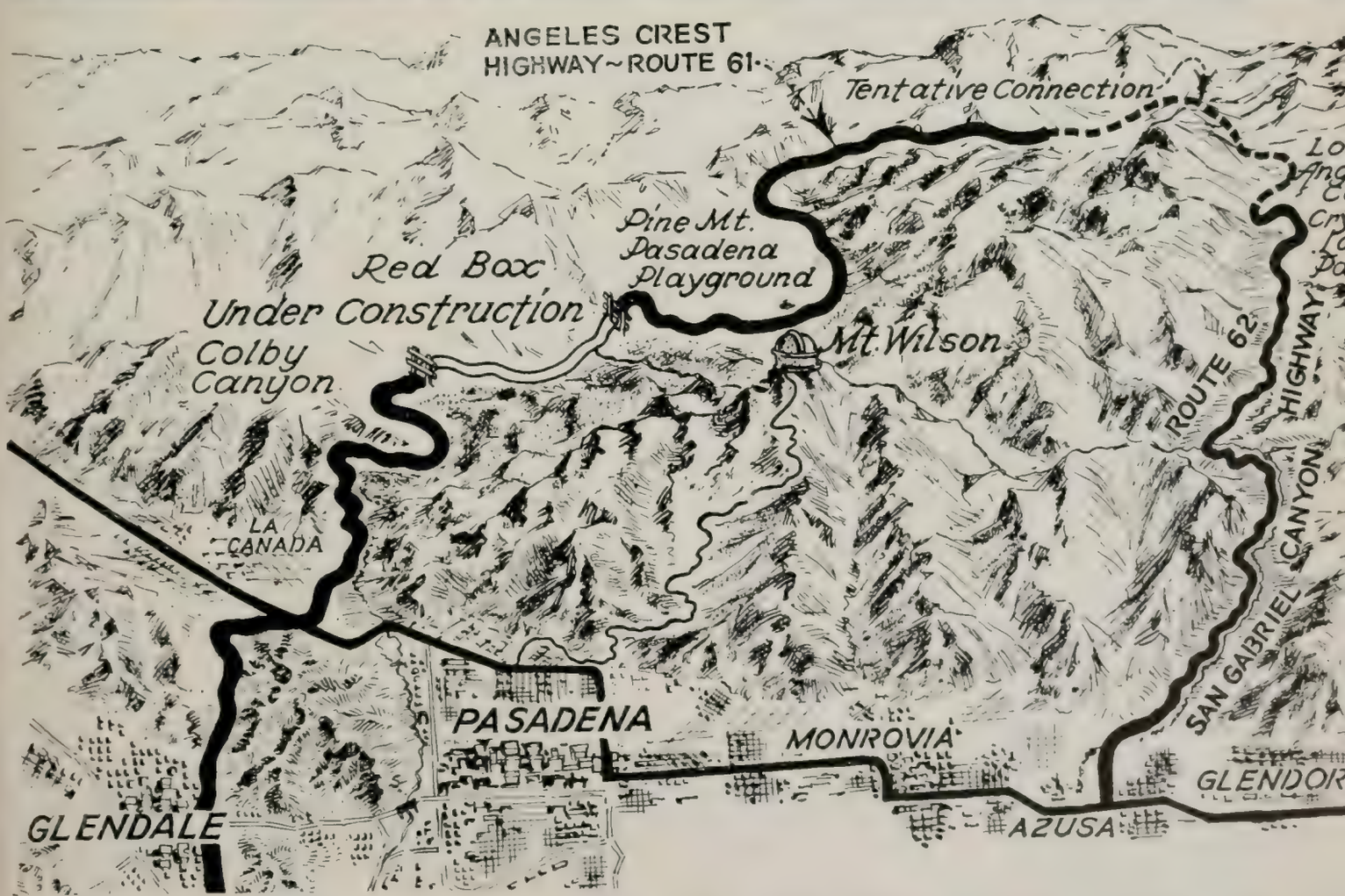
CONNECTS WITH EXISTING ROAD

The new Angeles Crest Highway, following easy grades and good alignment from La Canada along the precipitous mountains toward Red Box (which is at the divide between the Arroyo Seco and the San Gabriel), has already been completed for $11\frac{3}{4}$ miles to Colby Canyon. The present contract includes the 3.96 mile section from Colby Canyon to Red Box, and, in connecting with the present Forest Service road at this point, will render this large area of back country, now traversed by the Forest Service road, readily accessible to automobile traffic from Los Angeles and surrounding country.

This highway is one section of a general plan for a 65-mile drive known as Angeles Crest Highway. When completed, it will leave Foothill Boulevard at La Canada, following the new Angeles Crest Highway to Red Box thence following the U. S. Forest Service road northeasterly through the city of Pasadena playground, Barley Flat, Chilao Flat and Buckhorn Flat, connecting with the San Gabriel Canyon Highway on the northeasterly slope of Mt. Islip near the Los Angeles County playground at Crystal Lake; thence down this San Gabriel Canyon Highway to again connect with the Foothill Boulevard at Azusa.

Of this proposed highway circuit the only portion which will not be completed when the present contract is finished will be from Buckhorn Flat to the San Gabriel Canyon road.

(Continued on page 29)



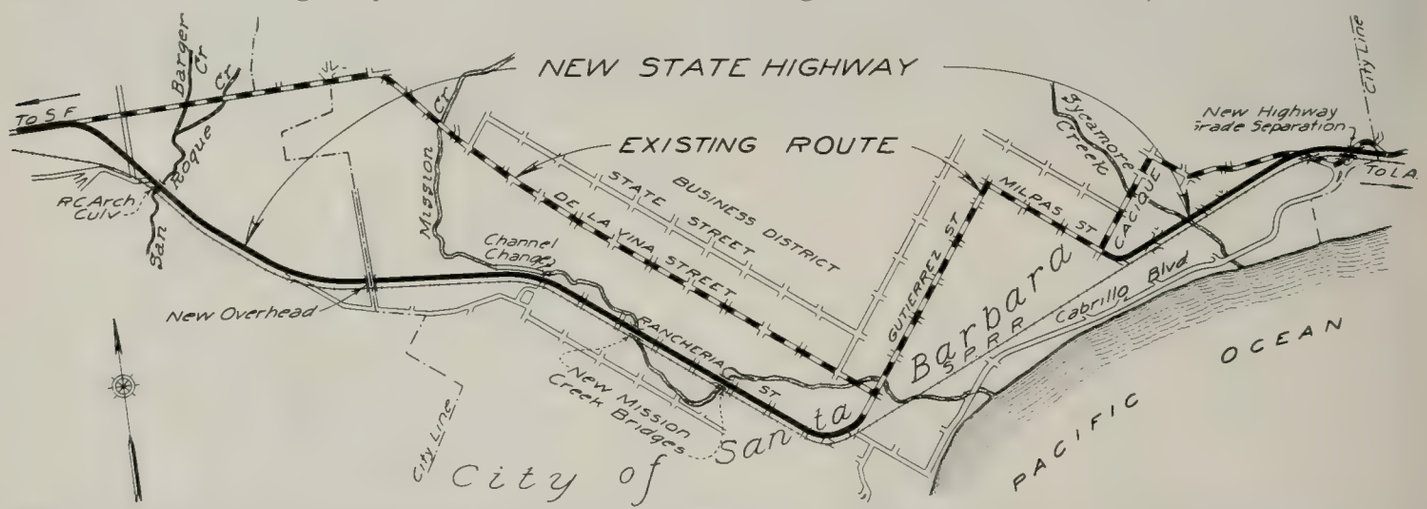
BEAUTIFUL VISTAS of high mountain scenery and a great expanse of virgin National Forest back of Mt. Wilson will be made accessible to the Los Angeles metropolitan area in September by completion of the last link of the Angeles Crest Highway shown above. The 65-mile loop tour that will be made available by the proposed connection with San Gabriel Canyon highway is shown in the pictorial map by artist Newton Pratt.

Santa Barbara Through Truck Artery Involves 4 Bridges and Channel Change

By **L. H. GIBSON**, District Engineer, District V

CONSTRUCTION is progressing rapidly on the new "Santa Barbara Through Traffic Boulevard," and it is anticipated that this welcome addition to the State highway system will be formally opened some time about November, 1934.

This major development will afford an entirely new, modern and adequate highway through the city and will replace, except for a short stretch, the present inadequate State route, as well as the present U. S. highway route, which differs in routing somewhat from that of the State highway.



SKETCH MAP of new through traffic boulevard by-passing congested business district of Santa Barbara.

The motorist, when entering Santa Barbara from the south along the present highway, is first confronted by a narrow underpass under the Southern Pacific tracks, where the grade is steep and the alignment on a 350-foot radius curve. A short distance farther on, the traveler again crosses under the railroad, under almost equally dangerous conditions; and thence proceeds along various city streets around no less than five right-angle turns, and then follows northerly along de la Vina Street, Hollister Avenue and out of the city on the north. De la Vina Street is very narrow and its congested condition has always been an annoyance to the traveler.

MANY FACTORS INVOLVED

All of these dangerous and inadeqate conditions for the handling of the volume of traffic using "El Camino Real" prompted a joint study by city and State engineers for projecting a modern highway development through the community. This study, needless to say, was not an easy one, as many factors were present, such as the utilization, as far as practical, of existing improvements, the appraisal of real estate and property that would be affected, and the drainage conditions encountered.

Finally, a route, closely paralleling the Southern Pacific railroad was adopted, which involves a total construction of 5.9 miles of highway, together with two steel and timber bridges over Mission Creek, a reinforced concrete overhead structure over the present highway, and a similar type structure to carry a county highway over the new road.

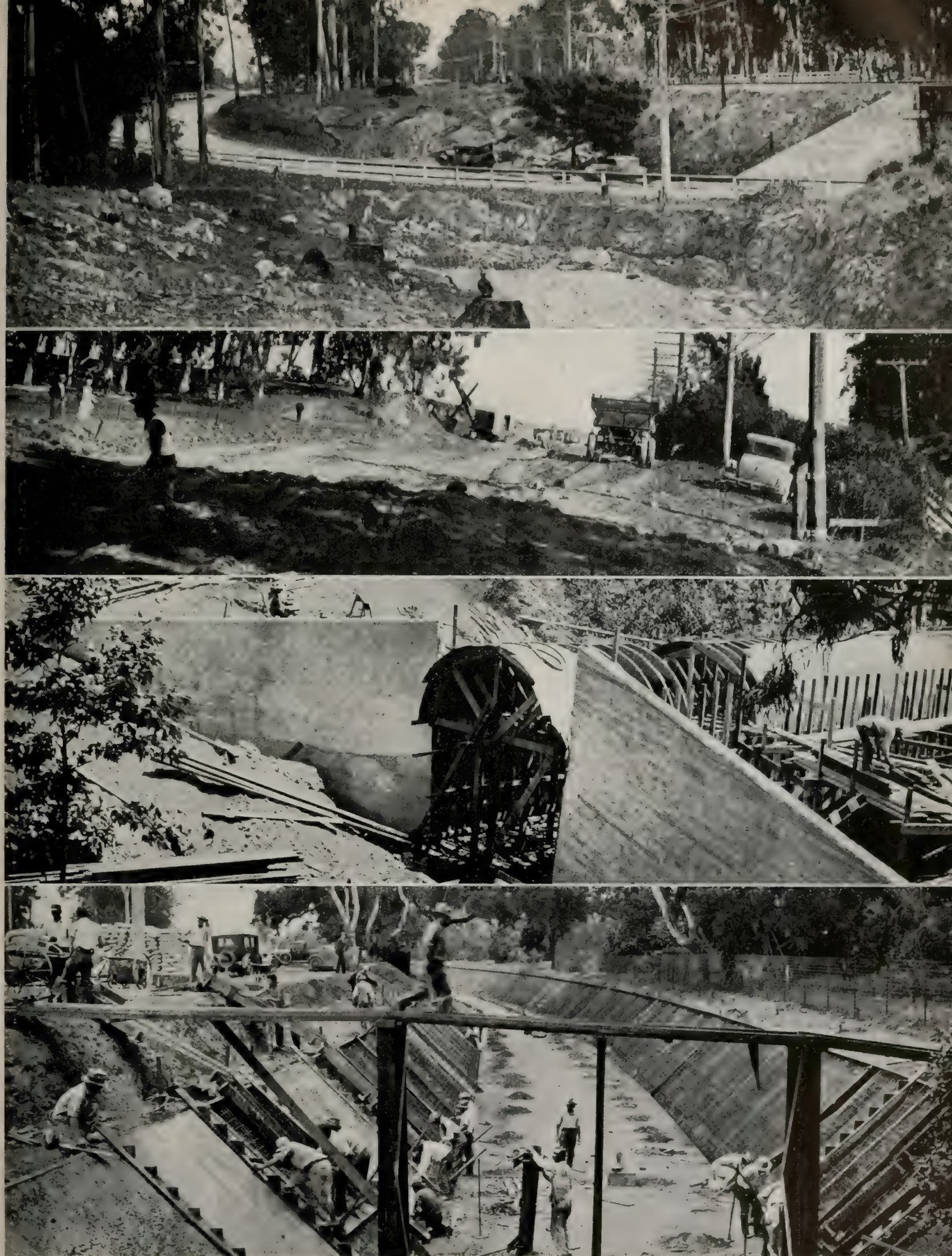
The new alignment has a graded roadbed width of 46 and 56 feet along the new alignment, and 76 feet in width where contiguous with existing city streets with surfacing 30 feet wide throughout, and all structures are being built to accommodate future widening.

The surfacing section is somewhat modified from general practice and consists of a 30-foot unreinforced Class "C" Portland cement concrete base topped with 2½ inches of asphalt concrete. The asphalt concrete specifications have been drawn up stipulating the use of Carpinteria asphalt sand, which is a local product.

CREEK CHANNEL CHANGES

Another construction feature of the work is the changing of the channel of Mission Creek over a length of 1100 feet. This work

(Continued in page 32)



BUILDING TRUCK BY-PASS through the busy city of Santa Barbara. 1—Clearing operations for traffic separation structure. Note dangerous approach of old road to the underpass under railroad. 2—Grading operations near southerly city limits. 3—Constructing a reinforced concrete arch culvert at San Rocque Creek. 4—Paving side slopes of new channel for Mission Creek. It will have a 20-foot bottom and 9-foot depth.

New Deal in Slope Treatment Aims to Prevent Erosion and Beautify Roadsides

By **E. S. WHITAKER,** Assistant State Arboriculturist

THAT phrase, "A New Deal," has become overworked and perhaps a bit trite in these last few months of this waning age of the depression, but it is so descriptive and fits so well with the outcome of the "slope question" that it is used once again in the hope that those interested in the subject of slopes will realize just how much of a change has taken place.

By slopes we mean, of course, those indefinite, unstable, leaning pieces of handworked soil that are inadvertently left after the construction of a highway, towering over, or gaping away from, the traveler—a bald-faced dénouement.

At first, the practice consisted mainly of taking away from a certain area as much dirt as was desired, then giving the part that remained a lick and a prayer. If it stayed where it was, all well and finished. If not, it was moved out of the gutter line over the bank, thus causing another slope, perhaps a bit more hidden from the view of the passer-by because of its position below the edge of the road, but every bit as bare and defiant as its foster parent had been.

SANDPAPERING EVOLVED

This type of construction is still carried out. But the people who think things out got together and decided that all that extra moving of dirt was not only unnecessary, but quite expensive. Better a small extra cost at first to keep the giant in hand than a continual tonsorial charge to keep him neat. So the idea of slope sandpapering was evolved with great success, in some places.

In those places, where the wind didn't blow too hard, or the rain didn't pour down with too much force, or the snow didn't lie with soaking effect upon their surfaces, or where their component parts did not contain too much blue clay, shale, sand, or loose gravel; in other words, where the ideal setup was encountered, the sandpapered slope assumed all the aspects of a pig in clover, and everything was fine.

But, let just one of these insidious malefactors creep into the scene, and, over a period of years or in one night, according to the temperament of the intruder, the beautiful straight edge and smooth-shaven surface of the slope degenerates and grovels in the gutter line.

NEW IDEAS DEVELOPED

With all these incongruous pieces of an unsolved puzzle laid out over the landscape tourists and natural beauty lovers have objected to the inharmonious, raggedly straight top line and seared and seamed faces confronting them at every turn. Engineers and maintenance men assumed poses that would have done justice to a Rodin and "out of the black that was 50 below" crept an idea. Scorned and ridiculed as a weakling, hooted and jousted at first, the idea persisted and grew. It developed into twins, in fact, triplets. These ideas have now become nearly full-fledged. They have been afforded tentative recognition and experimental attempts are being made that will, in a course of a few years, prove their success or failure.

The strongest one of these ideas—in fact it has really passed the fledgling stage and is making progress in its own right—is called "slope top rounding," which consists of the rounding off the tops of cut slopes and thereby: (a) getting rid of that extra overhanging weight; (b) blending the slope more naturally into the surroundings; (c) making easier the natural dissemination of seeds from growth along the top of the slope; and (d) affording a smoother run-off of water.

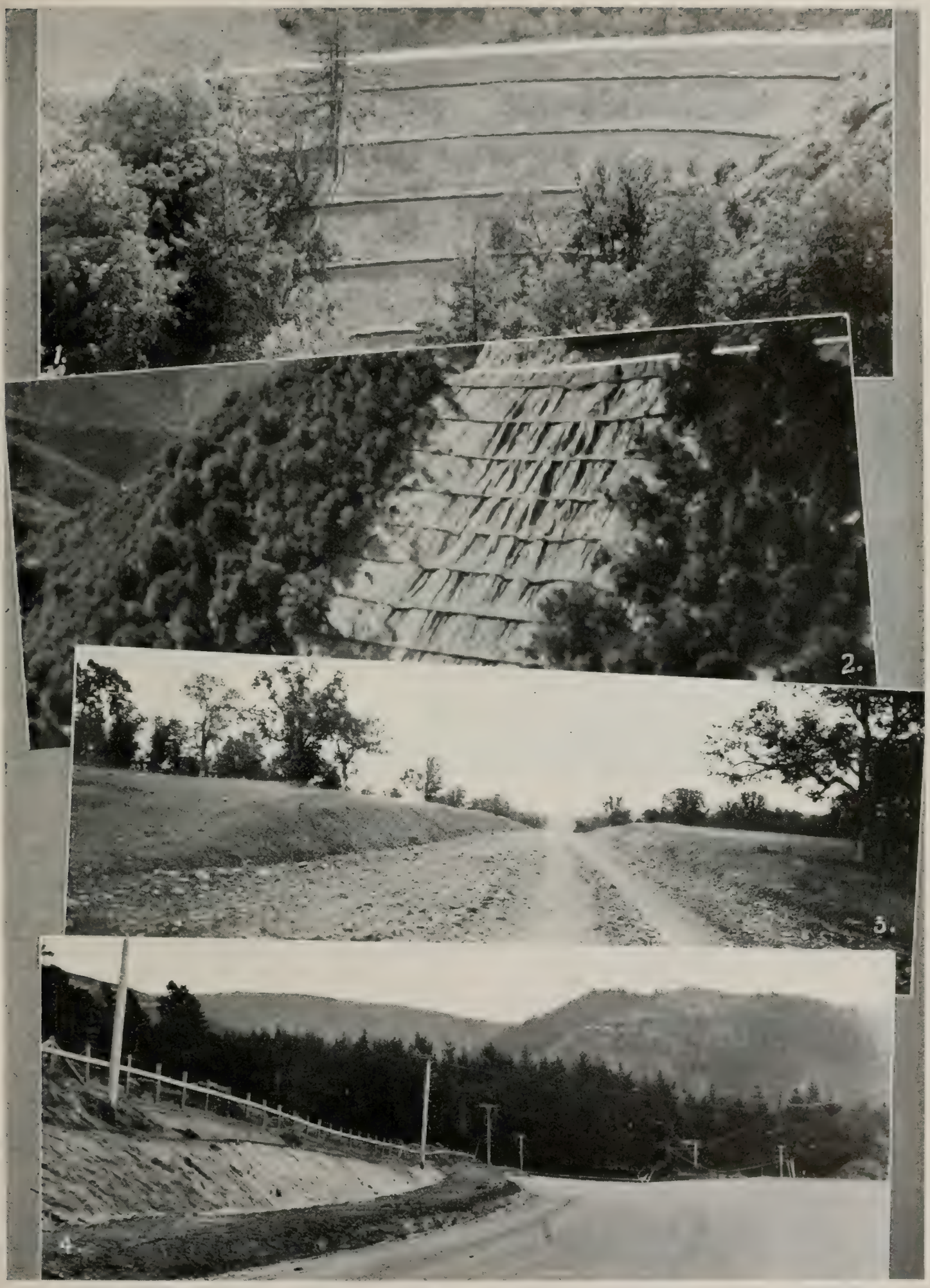
RELIEF LABOR UTILIZED

This work is being carried out on construction jobs and by maintenance forces. It has proved itself at least more pleasing to the eye, even if it does not ultimately stop the face falling of the slope. Wherever slopes are rounded, the scars of construction are far less noticeable. Relief labor has been utilized in this work by maintenance forces, and the effect, as far as "looks" goes, is all that can be desired.

On construction jobs, the slope tops are rounded and, in many cases, by the time the job is finished, the tops of the slopes are covered with grass and small seedling plants.

The twin of this trio of ideas is still in the

(Continued on page 11)



SLOPE PROTECTION, shown in picture No. 1, consists of pipe and wire fences, 39 feet apart backed by rocks and brush and held by 8-foot posts driven 5½ feet in ground. No 2 shows brush behind stake fences preventing erosion in Waterman Canyon, San Bernardino County. No. 3—Slope rounding on the Red Bluff-Susanville highway done in course of construction. No. 4—Slopes benched for planting.

Welded Air Pipe of Light Weight and Large Diameter Adds Drilling Efficiency

AN IMPROVED type of air transmission pipe line has recently been developed by the Construction Department in conjunction with the Equipment Department, designed to increase the efficiency of drilling operations and to facilitate handling of heavy pipe lines on hillsides.

At the various labor camps and on other major day labor projects where excavation often consists of almost 100 per cent solid rock, the problem of securing adequate and effective air pressures at the point of drilling becomes of paramount importance. Several camps operate six or more portable compressors, entailing the use of several thousand feet of pipe lines.

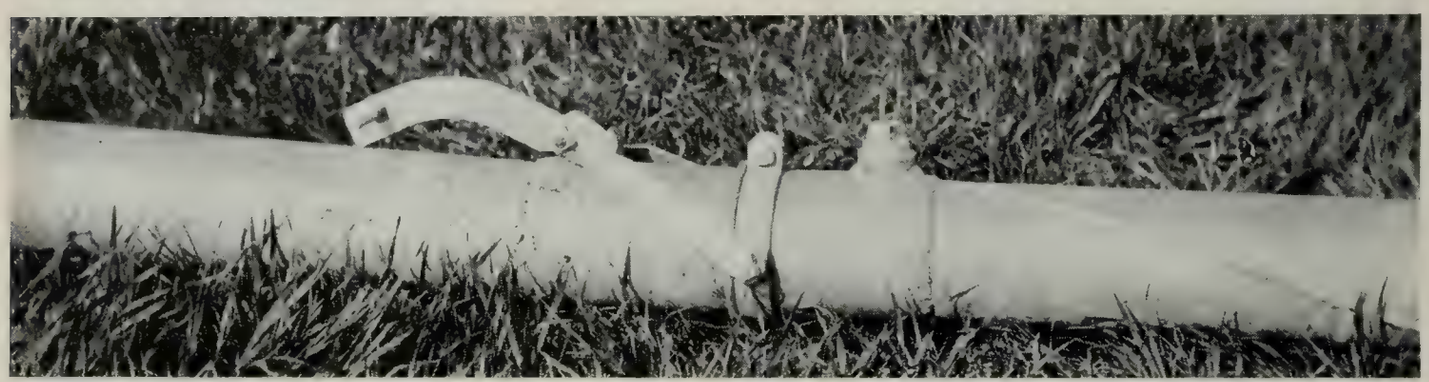
The transmission of compressed air through long pipe lines causes considerable drop in pressure due to frictional loss, especially if the pipe is of small diameter. For instance, a compressor with 400 cubic feet per minute capacity and a pressure of 110 pounds at the receiver, using three rock drills and the usual air hose connections on a 2-inch 3000-foot wrought iron pipe, gives a working pressure of about 61 pounds at the drills.

DRILLING SPEED INCREASED

This results in a very low drilling speed, a pressure of 85 pounds being most efficient. If this pipe size is increased to 2½ inches, drill pressure would rise to 92 pounds; 3-inch pipe would give 102 pounds and 4-inch pipe, 108 pounds.

The average 310 cubic feet displacement portable compressor has a volumetric efficiency of about 70 per cent, which means it will deliver about 215 cubic feet per minute at 90 pounds pressure. A 360 cubic foot machine will deliver about 250 cubic feet, and a 310 two-stage, or one with a supercharger, will deliver the same. Altitude decreases this volume about 1½ per cent for each 1000 feet.

Portable compressors of 450 cubic feet displacement are now available; also, where there is a large amount of drilling to be done, it is not unusual to use two 310 cubic foot compressors hooked up in tandem and regulated by one unloader; therefore the need of the larger size pipe line becomes apparent.



QUICK COUPLING device on light, welded air pipe shown in closed position.

ADVANTAGES OF LARGER PIPE

Another particular advantage of larger diameter pipe line is that it can be manifolded, and other smaller lines taken from it to suit the convenience of the job; it also acts as a storage tank or air reservoir, and permits much steadier working of the drills due to the volume of air it contains.

While it is very important to have adequate pipe line facilities for any volume of air, it is equally important that the proper number of drills be used for the available air volume. The average compressor can handle two heavy drills in fairly hard rock, when used in unison, and give better results than three drills.

Wrought iron screwed pipe is somewhat expensive to handle in mountainous regions, and the threads are easily damaged, resulting in air leaks. At the Kings River convict camp in Fresno County, experiments were made early in 1933 in the use of a 4-inch spiral welded galvanized air pipe, of light weight, with quick detachable couplings,

SPEEDY DRILLING is obtained on heavy rock work by the use of this light, large diameter, welded air pipe equipped with quick coupling device.

which has proven quite satisfactory for air compressor work.

CARRIED BY ONE MAN

This pipe is made up in 20-foot lengths, equipped with Venturi couplings and locking devices, with necessary elbows or other fittings, and 1-inch or 2-inch taps for making smaller pipe connections. This 20-foot length of 4-inch portable pipe is readily carried by one man, and can be adjusted to horizontal or vertical curves on irregular topography. Other camps are also using this type of air line, about 7200 lineal feet having been purchased to date.

The following figures showing the theoretical loss in pounds pressure by friction, per 1000 feet of pipe length, may be of interest in drilling operations:

Pipe size, inches	Weight per ft., pounds	Air delivered cu. ft./min.	Pressure loss due to friction, pounds
2	3.65	250	6.72
2	----	350	13.41
3	7.57	250	.77
3	----	350	1.54
3	----	450	2.57
4	10.79	250	.17
4	----	400	.45
4	----	500	.68

QUICK COUPLING FACTOR

It will be noted that the weight of a 20-foot length of 2-inch pipe such as is in common use is 73 pounds, of a 3-inch pipe is 151 pounds and of a 4-inch wrought iron pipe is 216 pounds.

The weight of the new type 4-inch pipe is about 75 pounds per 20-foot length, including couplers. The light weight spiral weld pipe has a safe working pressure of 250 pounds per square inch and the rapidity with which it can be coupled up is a valuable factor. Airtightness is maintained by the use of rubber gaskets of simple design.

After an experience of about a year and a half we feel justified in saying that we would not undertake any extensive drilling operations without using the large diameter light weight pipe.

YERBA BUENA PIERCED JULY 23

Notified by Chief Engineer C. H. Purcell that the first Yerba Buena Island pioneer tunnel will be driven through by July 23, State Director of Public Works Earl Lee Kelly has invited fellow members of the California Toll Bridge Authority, including Governor Frank F. Merriam, to walk through this bore and inspect the progress made by the San Francisco-Oakland Bay Bridge on the first anniversary of its construction.

The tunnel will be wide enough for a one-track mine railway and approximately 20 feet high. The completed tunnel will be 78 feet wide and 58 feet high.

Bump—Has your wife learned to drive the car yet?
Bumper—Yes, in an advisory capacity.

One-third Loss If Gas Tax Diverted

(Continued from page 1)

ways, not less than 25 per cent on secondary or feeder roads, and the remainder on State highway projects within municipalities.

Another significant provision, that evidences the Federal government's disapproval of gasoline tax diversions, specifies that the State shall be deprived of one-third of the $7,932,206 if gasoline tax revenues are used for any other purpose than highway work.

WORKING ON PROGRAM

The engineers of the Division of Highways are now concentrating on a study of eligible projects for the expenditure of these funds, making an analysis of the needs of the State highway system and the estimated costs of such improvements. Their recommendations are being considered in the preparation of a program for putting this money to work as speedily as possible.

The engineers estimate that approximately $7,200,000 of the $18,200,000 will go to job site labor, that is to men employed directly in construction work on the highways and will thus provide 1,440,000 man-days' work. Another $9,076,000 will go to workers "behind the lines" in related industries—the ratio is two men for every one on the job. This, it is estimated, will give approximately 1,815,000 man-days' labor for workers on the pay rolls of companies manufacturing or producing highway building materials and supplies; trucks, graders, tractors and other equipment; transportation and many minor industries.

In addition to the amounts given above for construction purposes maintenance work for the fiscal year is estimated at about $6,972,600 which will provide an additional 1,255,100 man-days' work making a total for the fiscal year of approximately 4,510,100 man-days' of employment.

Illustrative of how State highway work has provided a very much needed backlog of employment all over the State during the past year, Director Earl Lee Kelly of the Department of Public Works informs me that during the period from August 25, 1933, to June 15th of this year, construction work put under way has totaled 2363 miles of highway improvements, exclusive of traffic striping, and 92 bridges and grade separations.

This vast amount of work has been done at an expenditure of $23,940,000 and has provided approximately 4,788,000 man-days' labor.

Contractors reported 4400 men employed at job site on State highway work on June 1st. This means that approximately 13,200 men were getting wages through contract work alone on that date. The regular forces of the Department of Public Works engaged on highway work number approximately 4,000. Relief quota crews made up of unemployed men doing hand labor maintenance work at $4 a day and getting a minimum of four days' work a week number approximately 3000. Add to these groups 8000 men employed on the San Francisco-Oakland Bay Bridge, 110 staff and field men in the Division of Architecture, approximately the same number in the Division of Water Resources, and we have a total of 28,400 men now gainfully employed directly or indirectly on Public Works.

ADEQUATE HIGHWAYS CONSIDERED DOMINANT FACTOR IN MODERN LIFE

Highway transportation is a dominant factor in modern life in rural sections, as well as population centers, of the United States. Adequate highways are needed every day for economic, educational, religious and social reasons. The motor vehicle supplies a flexible unit of transportation with a radius of operation limited only by inadequate highways.

The comprehensive planning of such systems, adequate to meet future traffic needs, is the most important problem confronting the highway business not only in the various regions and States but in the United States as a whole. It is important because it is fundamental.

The engineering supervision of construction, maintenance and other phases may be perfect, but unless the administrators have the foresight to make studies and investigations with a view toward planning the highway systems of the future, they will have failed to administer the highway work on a sound engineering, business basis.—Regional Plan of the Philadelphia Tri-State District, 1932.

Slope Top Rounding Part of the New Deal By Arboriculturists

(Continued from page 6)

experimental stage although quite extensively so. It has a twofold purpose and seems well on the way toward being able to fulfill all promises in both cases.

"The preparation of fill slopes to prevent excessive erosion and to obscure the scars of construction" is the title of the twin. This work is being carried out by maintenance forces and has its greatest trial ground on the large fill slopes of the Crest Drive, that beautiful road from San Bernardino to Lake Arrowhead and Big Bear Lake.

FILLS BEING PLANTED

These fills, in some cases, have run several hundred feet down the mountain side and can be seen from nearly any part of the valley below. To prevent erosion and to cover these bare areas as soon as possible, they have been cross-hatched with brush filled ditches or with grain hay. It is surprising how much wash a small clump of grass roots may prevent.

In some cases, cuttings of trees and seedling trees have been planted on the fill. Seeds of native plants have been gathered and scattered on the slopes, anything that might grow, so as to get the surface covered with a mat of roots. Hidden and held in place by native growth, these scars will soon be only a memory. A worthwhile use of relief labor, because a dollar spent now will undoubtedly save manyfold in the future.

And now comes the runt of these three ideas—the one which has been tried with much misgiving and occasional dire results, and has had to be babied along nearly as much as its antonym, the sandpapered slope. This idea deals wholly with the beautification of roadsides, although some common sense logic enters into the case.

BENCHING AND PLANTING

Why—say we—sandpaper a slope, using extra time and money in that hand labor operation, when in a relatively short time the slope will look as ragged as though never touched? Why not leave it rough, and in places pocket and bench the larger slopes so that shrubs may be planted to assist by their root growth in holding the slope to a semblance of stability and to screen and partly obscure its baldness?

This has been done in many experiments in a small way, and, in one case, extensively. On the contract through Carmel Highlands where so much natural beauty was defaced, this method was resorted to so that restoration would be more rapid. We hope it works. We hope all three of them work, because they mean more beautiful highways, a greater attraction to tourists.

$20,944,729 in Major Highway Contracts Let in Ten Months

MAJOR contracts for construction let by the California Division of Highways between August 25, 1933, and June 15, 1934, totaled $20,944,729. As of June 15 the division was advertising work estimated at $1,500,000, the major item of which was the M Street bridge in Sacramento, to cost approximately $900,000. The total of all work, including day labor and minor lettings, for the ten-month period was $22,848,634.

During the period from August 25 to June 15 construction was undertaken on principal routes by contract to the amount of $11,965,263 outside incorporated areas, and $5,620,213 within incorporated cities. Construction by contract on miscellaneous routes totaled $2,979,030 and on feeder roads, $380,223.

COAST ROUTE CONTRACTS

The largest allocation on a single route was on the Coast Highway between San Francisco, Los Angeles and San Diego. Contracts amounting to $2,393,087 were let on this route, exclusive of work through municipalities.

Work on the Pacific Highway from San Francisco to the Oregon line was contracted to the amount of $1,116,297, the total including $407,703 for grading of the new American Canyon link between Carquinez Bridge and Cordelia.

REDWOOD HIGHWAY WORK

On the Redwood Highway work had been completed by June 15, or was in progress, amounting to $2,074,548, including the rerouting in Del Norte County costing $713,634 and realignment in Humboldt County near Garberville costing $375,493.

Carmel-San Simeon route contracts amounted to $1,090,138.

The Valley Route between Los Angeles and Sacramento received $598,437 exclusive of several contracts in municipalities on the route.

First Cajon-Lancaster Highway Link Broken Through Summit of Ridge

THE FIRST unit of the important new Cajon-Lancaster highway, connecting the San Bernardino area and the eastern part of southern California with Owens Valley and San Joaquin Valley, is rapidly approaching completion. The construction of the new route, 14.5 miles in length, which extends from the junction of the Cajon Pass and Wrightwood Roads through Cajon Valley, has reached the cliff at the head of Cajon Canyon and contractors have broken through the summit of the ridge.

The present unit is under contract for $145,000. With $240,000 provided in the budget it is expected that the contract for the second link will be advertised for bids within a few weeks and that the whole project will be completed for next winter's travel.

This new route provides a direct connection for movement of winter vegetables from Imperial Valley and citrus fruits from the San Bernardino-Riverside area to the San Francisco Bay region. People from the central and northern part of the State will be able to come over this route to a direct connection with the southern transcontinental highways and desert winter resorts.

SAVES 15.5 MILES

The new highway results in a saving of 15½ miles in distance over the existing route and the new route is on easy grades and direct alignment. It follows beautiful Cajon Valley and crosses the summit at the end of Cajon Canyon through a single large cut made by tearing down a great cliff.

When completed the cut will be 125 feet deep, one-third again as high as San Bernardino's tallest structure, and five feet above any Los Angeles building, with the exception of the City Hall. To dig this cut roadbuilding equipment had to be moved up the mountain over a tortuous old government road. Scrapers were used for the first thirty or forty feet of the cut leveling operations before safety would permit the sending of shovels and trucks up the steep hillside.

Material taken from the cut is spread down the valley for about a mile of distance to build up fills through a number of the cross canyons and make a gradual, easy grade for the motoring public up out of the valley.

PICTURESQUE SEISMIC ROCKS

Cajon Valley was formed in bygone ages by the San Andreas fault. The scenery is spectacular. Large sandstone blocks are upended. Some of these sandstone blocks rise over 200 feet above the valley. They have a peculiar rounded appearance, very unusual in California scenery.

Vegetation in Cajon Valley is of unusual interest, as it is typical of California as well as of the Mojave Desert. This vegetation partakes of a transition from the valley to the desert and examples of Joshua trees, yuccas, pinyon pines, and junipers grow to luxuriant size.

SCENIC PANORAMA DISCLOSED

Travelers from the north will cross the desert and get the first glimpse of southern California between the walls of the great cut at the head of Cajon Valley. The view from this cut is truly magnificent. Mount San Jacinto and San Bernardino rise up in the distance, with Cajon Valley and the foothills in the foreground.

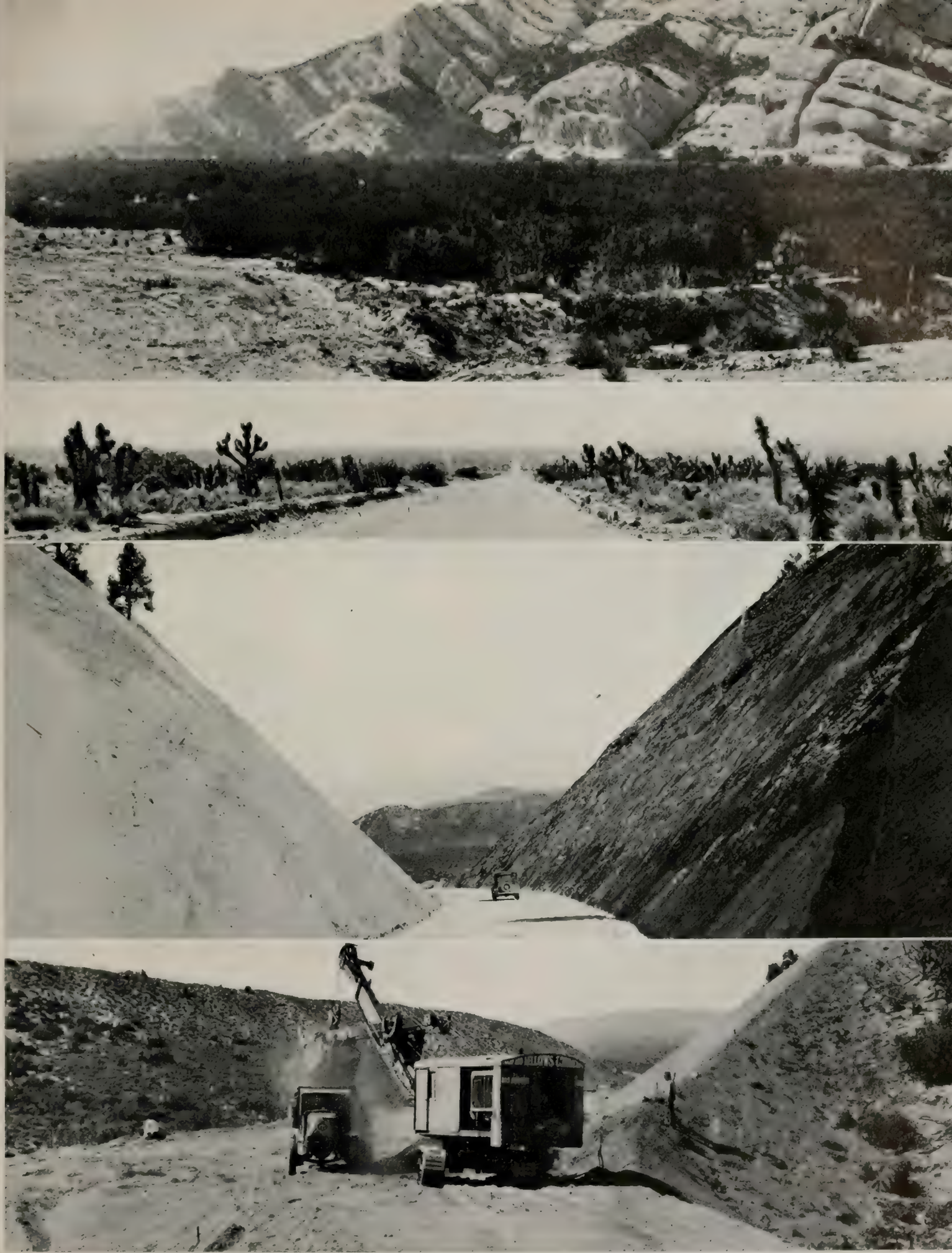
The U. S. Bureau of Public Roads has just completed a survey from this new route to connect to Los Angeles County Park at Big Pines. This survey discloses that an easy connection can be made which will permit of the approach to the Los Angeles County Park on a high gear road on good alignment.

FIRST STEREOPHOTOGRAMMETRY QUADRANGLE SHEET AVAILABLE

Advance sheets of Lakeport Quadrangle prepared by the U. S. Geological Survey in cooperation with the State of California are are now available.

This is the first sheet of its kind produced in California from aerial photographs reproduced by stereophotogrammetry. The scale is 1 : 48,000, but it will finally be published on a scale of 1 : 62,500. The contour interval is 50 feet.

It will probably be found necessary to add some details by ground survey methods.



BIZARRE DESERT SCENERY is encountered along the Lancaster-Cajon cutoff now approaching completion. It traverses an interesting part of the great Mojave Desert in San Bernardino and Los Angeles counties. In Cajon Valley it passes a weird mass of sandstone blocks piled up by volcanic action ages ago and through a forest of Joshua trees and Yuccas. Great cuts were made through the hills, one of them 125 feet deep, that provided material for fills on a mile highway construction.

How State is Enforcing Law to Insure Safe Construction of School Buildings

By **C. H. KROMER**, Principal Structural Engineer

THE Safety of Design and Construction of Public School Buildings Act, with the administration of which the Division of Architecture was charged by legislative enactment, has been in active enforcement for over a year, having been made an emergency measure to take effect immediately upon signature by the Governor on April 10, 1933.

In anticipation of the passage of this measure, a tentative organization plan was worked out ready to be immediately initiated and rules and regulations together with necessary forms were written and placed in the hands of the State Printer ready for printing by the time that the bill was signed and became law or within a period of about two weeks, at a time when the personnel of the division had shrunk to skeleton proportions.

C. H. KROMER

Starting with an initial group of only three men, the personnel employed in the administration of the act has grown rapidly until at the present time the personnel of the Division of Architecture actively engaged numbers 75. In addition, 61 inspectors are employed directly by the various school districts to serve as inspectors of construction under the direction of the architect or structural engineer connected with the project and under the general supervision of the Division of Architecture.

ONE THOUSAND APPLICATIONS FILED

Over 333 applications have already been made for approval of plans and specifications and over 1000 applications filed for examination of existing school plants. The magnitude of the work involved can better be realized when it is pointed out that the public school buildings in California coming under the act are valued at from $400,000,000 to $500,000,000. The total value of new building projects as well as reconstruction work proposed for southern California is estimated to exceed $50,000,000. This is entirely independent of work contemplated north of the Tehachapi or for our larger cities such as San Francisco, Oakland and Bakersfield.

The technical work required in the reconstruction and strengthening of buildings in both northern and southern California is so involved that the State as well as those engaged in private practice is required to give from two to three times as much service as would be necessary were the expenditure for entirely new construction.

The State thoroughly appreciates what this all means in connection with school housing and in providing work for the construction industries and consequently is making strenuous efforts to meet the situation.

HOW STATE FUNCTIONS

Examinations are under way or have been completed for approximately 430 school plants and all plans for construction of school buildings except for four recently filed have either been approved or are in the process of being checked.

The functions of the Division of Architecture with regard to the act are divided into two specific activities. The first has to do with the approval of plans and specifications and the supervision of new work. The primary purpose in giving such approval is to make sure that school buildings hereafter constructed will be safe for both teachers and pupils and that such buildings are honestly built both as regards materials and workmanship.

Incidentally, the State Department of Public Works rather than the school department becomes responsible for the safety of the buildings thus constructed.

Particular emphasis has been placed on the matter of inspection. Not only must this inspection be continuous and verified report made by the inspector that work and materials

(Continued on next page)

School Board Responsibilities Defined

(Continued from preceding page)

are in accordance with approved plans and specifications, but the architect or structural engineer in charge of the work must make a similar verified statement of his own personal knowledge. Any false statement or violation of the act constitutes a felony.

CALIFORNIA LAW FIRST

As far as we know, California is the first State to enact such a requirement in connection with public school buildings to insure honesty and competency in both design and construction.

It should be pointed out at this point that buildings designed or reconstructed in accordance with Appendix "A" of the Division of Architecture are in general subject to materially lower earthquake insurance rates than would be the case for similar buildings designed without any regard to bracing or earthquake resistance. This reduction in rates, depending upon the probable resistance of the structure, is relatively large. The variance is as great as fifteen cents for an adequately designed building to $3.50 for hazardous construction.

Our attention has recently been called to a building the cost of which, designed to resist earthquake, was actually less than if no provision had been made for earthquake forces, due to the reduction in insurance rates. An article "Earthquake Design for an Eight-Story Apartment House," by Harold B. Hammill, Structural Engineer, in an issue of *Engineering News Record* dated November 16, 1933, gives an illustration where the additional cost for earthquake resistive construction was only 1.9 per cent.

The Board of Fire Underwriters is doing everything possible to encourage safe construction, and is giving consideration through reduced rates to additional bracing, even though not great in amount.

EXAMINATION OF BUILDINGS

The other function in connection with the administration of the act has to do with examination of existing school buildings and since some misunderstanding appears to have arisen in the public mind in regard to these matters, certain pertinent facts are here being pointed out:

1. Examinations and reports with reference to existing school buildings are made by the Division of Architecture only upon specific request of school officials or upon request of parents of pupils enrolled. Whether or not such examination is to be requested is entirely optional with the districts concerned.

The State Department of Public Works merely acts as agent of the school district. Such reports as are made are informative only and the district need do nothing further in the matter unless it so desires.

The State has always had physical surveys made of its own institutional structures whenever any question arose as to their safety. Certain of such buildings examined have either had to be demolished or reconstructed when not found to be safe. The school building construction act merely makes it possible for the school districts to avail themselves of the same service the State has had in the past.

SCHOOL BOARD RESPONSIBILITY

According to our understanding there is nothing in this act which places any additional responsibility on any school board other than that embodied in the existing statutes established prior to the enactment of this act. It does, however, provide the school board with a means of meeting its responsibility and even being relieved of it.

School boards throughout the State have been caused considerable concern by an opinion rendered by the Attorney General to Mr. Vierling Kersey, Superintendent of Public Instruction, under date of November 22, 1933. In this opinion, the question of liability or responsibility seems to hang on whether the district itself or its employees have been negligent in not taking proper precautions to provide safe buildings. The matter is covered in detail in the opinion just referred to.

The school building act merely focuses attention on the matter of possible danger that might occur in the event of an earthquake and provides a method whereby school boards may have authoritative information regarding the structural condition of their buildings.

Except for the fact that a warning has been sounded and possible danger to life and property recognized, it does not appear that it is any more necessary for school districts to go to the expense of making alterations or reconstructing their buildings than has heretofore been necessary nor is it any more necessary to close school buildings.

RESPONSIBILITY NOT INCREASED

All that has been done is to attract attention and to emphasize responsibility of school boards but the responsibility itself has not been increased.

2. Approval will be given to submitted plans and specifications for strengthening or reconstructing a portion of a school building even though the remainder of the building is not found to be safe. However, approval will be given on the basis that the use of the building as a whole for school purposes will be entirely upon responsibility of the school authorities and without the approval of the Division of Architecture except for the portion covered by the submitted plans and specifications until such later time as the remainder of the building may be completed in accordance with the provisions of the act.

If, however, on examination, the remaining portion of the building is found to be safe then a certificate will be issued stating that the building is safe and meets the requirements of Chapter 59, Statutes of 1933.

FIRE HAZARD PROVISIONS

3. The act is not retroactive and accordingly the division is confining itself with reference to fire hazard to calling attention of the particular school authority to the lack, if any, of reasonable fire safety as interpreted by the division, and the school authorities may or may not, as they see fit, make corrections involved

(Continued on page 26)

Governor Merriam's Shovel Starts Alameda-Contra Costa Tunnel Work

SEVEN thousand Alameda and Contra Costa County residents gathered in a natural amphitheater in the Claremont District at Broadway and Chabot Road, Oakland, on June 17, and saw the formal starting of the long-awaited $3,752,000 Broadway low level tunnel which will replace the present tunnel road between Contra Costa and Alameda counties.

Three shovels full of earth lifted by officials started the job. The officials were Governor Frank F. Merriam, State Director of Public Works Earl Lee Kelly and Supervisor Thomas E. Caldecott of Alameda County, president of Joint Highway District No. 13, comprising the two counties.

But more than Alameda and Contra Costa counties will be aided by this double-bore tunnel through the Berkeley hills.

By this tunnel the residents of Contra Costa County will be enabled to live in this beautiful section and work in San Francisco, because the tunnel will make it possible to drive to San Francisco in less than an hour from Walnut Creek.

The gasoline tax which makes this possible (in this instance with PWA Federal aid) was the theme of the leading speakers at the ceremonies managed by the Berkeley and Oakland Junior Chambers of Commerce.

These ceremonies began at a luncheon in the Claremont Hotel and continued through the afternoon with aerial mapping, daylight fireworks, a cross country race over the route of the tunnel and highway project, band music, speeches by those responsible for the project, and a moment of silence as an impressive bugle call of taps sounded in memory of the late Governor James Rolph, Jr.

STAND AGAINST DIVERSION

Friends of the California highways who thanked the gas tax fund for making possible California's leadership in highway construction and maintenance, and who obligated themselves to use the gas tax fund exclusively for highways, were notably Governor Frank F. Merriam, Director of Public Works Kelly and Senator Arthur H. Breed.

GOVERNOR MERRIAM SAYS:

"The gas tax has supplanted the bond issue method and is a pay-as-you-go plan immeasurably superior to bonding as a means of highway financing.

"The people of California in a recent election by an overwhelming majority, expressed their belief that gasoline taxes should be used exclusively for highway construction and maintenance.

"I am unalterably opposed to the diversion of gasoline taxes from the purpose for which they are collected."

"Because of the late bond issue method of financing highways, we are still paying for highways long since worn out," Governor Merriam declared.

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"I am unalterably opposed to the diversion of gasoline taxes from the purpose for which they are collected."

GOVERNOR IMPRESSED CROWD

With the State financing becoming increasingly difficult and with an ever present number of budgeteers always recommending to the Governor and to the legislators that financial problems be solved by dipping into the gas tax fund, Governor Merriam's unequivocal statement produced a profound

(Continued on page 22)

STARTING WORK ON A GREAT PROJECT, Governor Merriam and Director Earl Lee Kelly participated on June 17 in ground breaking ceremonies at Oakland for the Broadway low level tunnel to connect Alameda and Contra Costa counties. In the upper picture Governor Merriam is seen turning the first shovelful of earth assisted by Director Kelly; Supervisor T. E. Caldecott, chairman of Joint Highway District No. 13; Dudley W. Frost (kneeling), chairman of Oakland and Berkeley Junior Chamber of Commerce Committee, and a group of young women representing participating communities. A beautiful eucalyptus grove at Broadway and Chabot Road, Oakland, was the scene of the formal exercises, which included speechmaking, music of massed bands, pageantry and fireworks.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ---------- Director
JOHN W. HOWE ---------- Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 15 JULY, 1934 No. 7

Gasoline Tax Funds

Never in recent years has a legislative session approached without designs on the part of some group for the diversion of gasoline tax funds to other purposes than that for which the tax is levied. Protests on the part of automobile owners against such action thus far has defeated these various moves.

Now there is a proposal for the use of $30,000,000 highway funds for the relief of the unemployed, with the first result that the State's road program would be disrupted, with many thousands of other families thrown upon the various counties for charity support.

Public sentiment upholds the policy that work is better than a dole. If there must be a dole it should not come at the expense of constructive plans which give direct employment to many men and which stimulate a demand for labor in related industries.

Washington is considering new and heavy appropriations for relief. This would seem to be the place to turn when county and State resources for this purpose are exhausted.

To divert gasoline taxes would stop highway construction and hamper maintenance at a time when the State has taken over thousands of miles of secondary roads, thus relieving county taxation. It would force an increase in the gasoline tax rate even to carry on the absolute minimum of road work; and the gasoline tax already is out of proportion, being endured only because of the splendid highways which it provides for the use of Californians and their tourist guests.—*Long Beach Press-Telegram.*

LOS ANGELES ARRANGING TO REVISE MAJOR TRAFFIC PLAN

Announcement that the Los Angeles Traffic Association proposes to revise, extend and modernize the major traffic plan, which in its original form is well on the way to completion, is a progressive step. Traffic is a growing problem and there will always be a necessity of planning for it. Before the major traffic plan, street improvement in this city was of the haphazard variety. For some years it has been better planned and coordinated, and more of the same sort of thing is obviously desirable.—*Los Angeles Times.*

PROPERTY OWNERS ADOPT SET-BACK LINE FOR SIGNS

The Los Angeles County Regional Planning Commission, by detailed zoning, has safeguarded two outstanding projects during the year. They are the Fifth Avenue and Holt Avenue highways entering Pomona. The Holt Avenue development is a link of the Garvey-Ramona Boulevard project extending into Los Angeles. With the consent of property owners, billboards and commercial structures have been barred for 1000 feet back of the property line for a distance of 13 miles along these highways.—*Los Angeles Examiner.*

Seven Bridges Being Built on Route 56

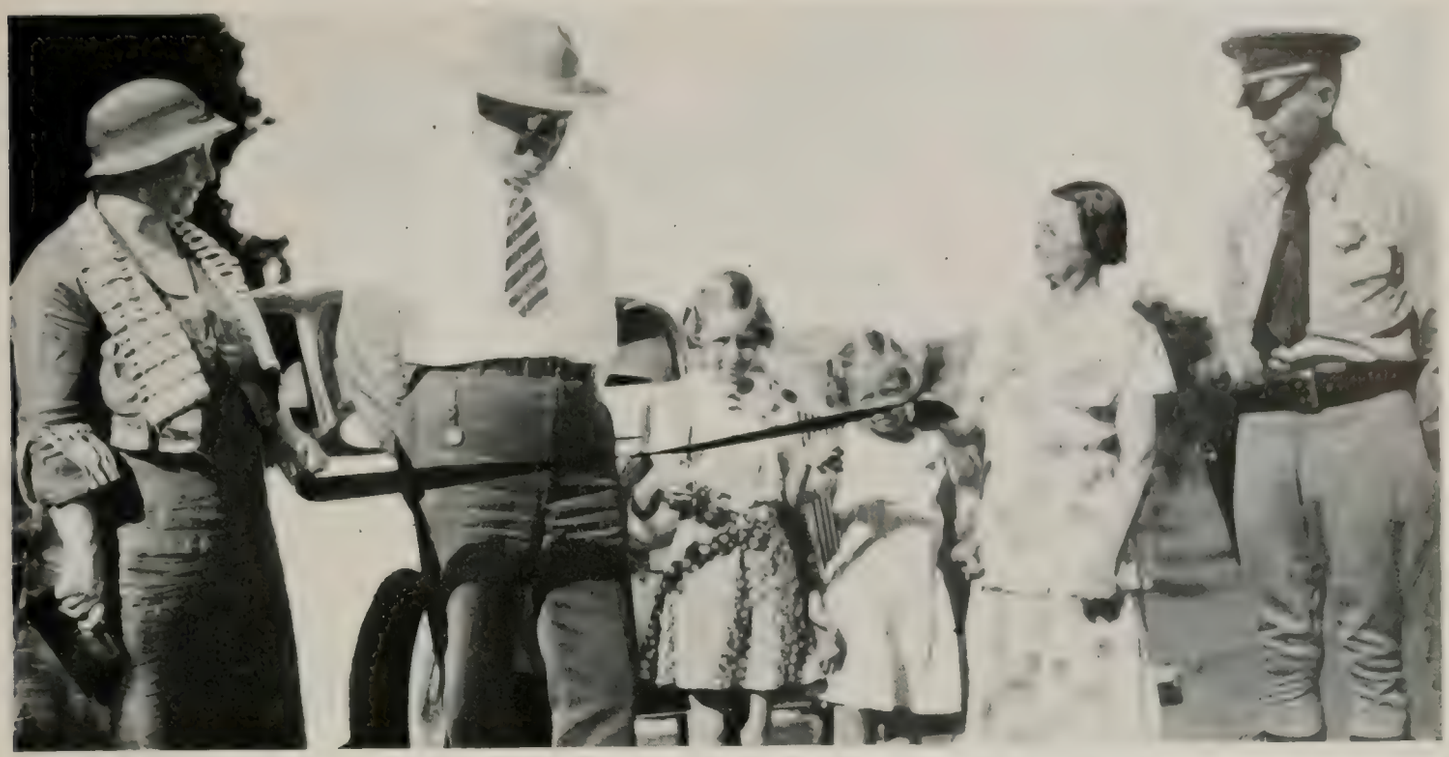
Bridge building crews are being kept very busy these days along the San Simeon-Carmel coast on State Route 56 erecting a number of timber bridges. Three structures have just been completed and seven more are under way.

Across Anderson Creek, 45 miles south of Monterey; across Buck Creek, 47 miles south of Monterey, and across Lime Creek, 49 miles south of Monterey, timber bridges with 24-foot roadways have been completed.

Under construction are similar bridges across Hot Springs Creek, 48 miles south of Monterey; across Dolan Creek, 50 miles south of Monterey; across Prewitt Creek, Wild Cattle Creek, Mill Creek and Kirk Creek, all located between 32 and 36 miles north of San Simeon, and across Willow Creek, 32 miles north of San Simeon.

"Can I borrow a cigarette, old man?"

"Well, you ought to be able to—you've had enough practice."



ANOTHER BARRIER FALLS as the winsome granddaughters of State Senator Frank L. Gordon clip the silk ribbon officially opening the newly improved unit of the Napa-Monticello Highway to traffic. Left to right, Mrs. Ernest C. Crowley, wife of Assemblyman Crowley of Suisun; Napa County Farm Adviser H. J. Baade; Mildred Gordon and Charlotte Gordon; Mrs. Frank L. Gordon and Captain J. B. Critchley, California Highway Patrol, Napa.

Auto Caravan Tour Celebrates Opening of New Highway Unit

CELEBRATING the first unit of improvement to the Napa-Monticello Highway, a large caravan was mobilized by the Napa Chamber of Commerce and Napa County Farm Bureau to drive over the new highway on June 19th.

This highway, which was improved and surfaced jointly by the State and the Napa County Board of Supervisors, traverses a series of very scenic canyons and valleys, including the Berryessa, Wooden, Capell and Gordon valleys.

The improvement considerably lessens the driving time and adds tremendously to the pleasure of driving between Napa, Monticello and intermediate points.

PROVIDES IMPORTANT CONNECTION

This sector connects with the highway from Monticello to Winters, thus providing a direct route between the Sacramento Valley, Napa County and the Redwood Empire.

The caravan was mobilized by the Napa Chamber of Commerce, of which C. C. Money is president and Charles Grady secretary. Various arrangements were handled by Herman C. Baade, county farm adviser for Napa County, who acted as grand marshal of the caravan.

Arrangements in and about Monticello were in charge of W. D. McKenzie, prominent Monticello citizen.

At a luncheon in the Peacock Hotel in Monticello the speakers included: Assemblyman Ernest C. Crowley, Charles Grady, City Attorney Lochman of Napa, Sheriff John P. Steckter of Napa, District Attorney Wallace Rutherford, the General Manager of the Redwood Empire Association and others.

LAW AFTER SLOW ROAD HOG

People who clog the highways by slow driving are the objects of a campaign inaugurated by the California Highway Patrol to promote safety and courtesy on the highways of the State.

E. Raymond Cato, Chief of the California Highway Patrol, has issued orders to executives and officers of the patrol to watch for violations of the California Vehicle Act covering this point, following numerous reports of accidents caused by slow-moving pleasure and commercial vehicles refusing to let faster cars pass.

"I understand your wife wanted a closed car but that you wanted an open one."

"Yes, but the incident is closed now."

Blink—My laundry sends back my shirts with different buttons sewed on them.

Blank—You don't know when you're well off. My laundry sends back my buttons with different shirts sewed on them.

New Los Gatos-Santa Cruz Link Eliminates 130 Curves, Saves 2 Miles

By **COL. JNO. H. SKEGGS,** District Engineer

STATE Highway Route No. 5 has one of its termini in Santa Cruz, an important coast city of California with a population of 14,395. This highway is the main thoroughfare between beautiful Santa Cruz City and County and the populous interior valley and bay cities.

The section of Route 5 between Los Gatos and Santa Cruz is distinctively a mountain road. The highway leads to Los Gatos over long tangents through vast orchards, and in departing from the town plunges at once into the canyon of Los Gatos Creek, and winds its way upward for 10 miles to a pass over the ridge of the Santa Cruz Mountain chain. Thence it descends for 15 miles of devious courses to Santa Cruz through forest covered hills, little friendly valleys dotted with homes, and patches of orchard—every turn in the road a new masterpiece of scenery. And from the vantage points over the summits, breath-taking panoramas of mountains and valleys and the broad sweep of the sea.

TRAFFIC HAS INCREASED

This mountain road section was constructed during the years 1915 to 1919. For the funds and standards available in those days, it was a good job but the rapid growth of traffic burden long since passed the point where the present road could be considered adequate to demands upon it.

The traffic count has steadily mounted, being well sustained, even during these depression years, and often reaches peaks in excess of 12,000 cars per day.

The problem of reconstructing this highway has been approached in the light of modern scientific road building, with full knowledge of traffic requirements, economies of design, and the relation of original cost to cumulative costs and savings depending on the design.

Ultimately all of the 25-mile section between Los Gatos and Santa Cruz will have come under the reconstruction plan already well formulated, and in considerable measure brought to realization. The section from Ocean Street in Santa Cruz for a distance of two miles toward Los Gatos has been completed; and an 8-mile stretch of the most dangerous and difficult part of the old road comprising the section between Inspiration Point summit and Scott's Valley has been replaced by 6.67 miles of new road, which has been graded and is now being surfaced. This particular section strikingly illustrates the evolution of the modern highway.

130 CURVES ELIMINATED

From a point nearly one mile east of the well named "Inspiration Point" the old road winds and loops about to find support as best it can, following the broken terrain and creek canyon leading into Scott's Valley. Original construction was under a principal control of low first cost, which effectually prohibited any large inclusions of an ultimate location.

The road was built from 21 to 24 feet wide, and paved to a width of 15 feet with Portland cement concrete, all at a cost of about $16,500 per mile.

On the new location starting from the same point east of "Inspiration Point" the reconstructed road strikes boldly out through the mountains with huge cuts and fills. By way of easy gradients and but few curves, the new road again converges with the old in Scott's Valley.

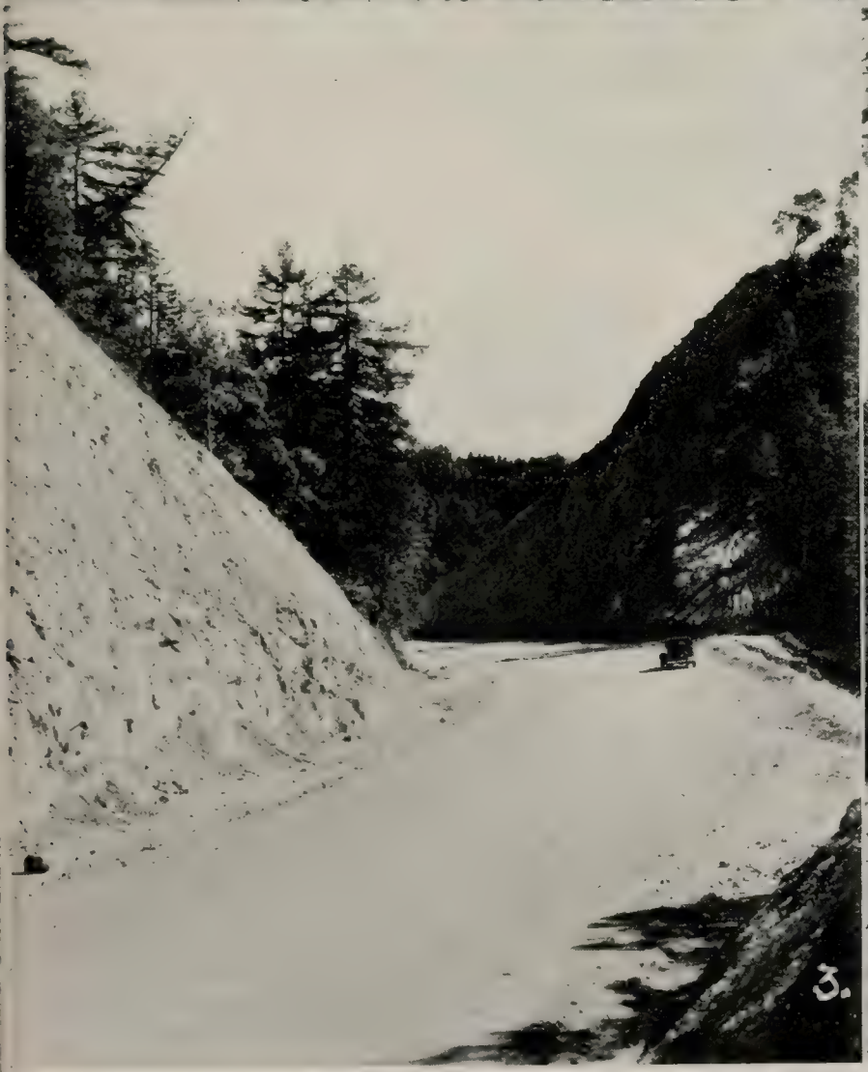
The cost of the new construction is approximately $92,000 per mile as against the $16,500 per mile for the old road. But between the termini there has been a saving of more than two miles in distance to be traveled, the number of curves has been reduced by 130, and 6101 degrees of curvature eliminated and the minimum radius of curve made 500 feet long as against 80 feet on the old road. The width of new road is a minimum of 46 feet through the mountainous section and 36 feet in the valley, or about 100 per cent greater than that of the old.

In relation to the present traffic, savings in operating costs alone derived from reduced travel distance, represent a profit of about 25 per cent as the yearly dividend on the money invested in the improvement.

INVESTMENT JUSTIFIED

If only a fourth of the motorists using this highway are concerned with distance saved the investment would still be justified on the mileage saving basis.

(Continued on page 31)



OVER THE MOUNTAINS between Los Gatos and Santa Cruz a fine new highway link is approaching completion, replacing a narrow old road of poor alignment. Parts of the new Scotts Valley-Inspiration Point link that cuts out 130 curves on State Route No. 5 are shown above. No. 1—Old and new road entering north city limits of Santa Cruz. No. 2—A view of the new road at Inspiration Point, showing a bit of the old route winding down around a cliff at the left. Nos. 3 and 4—Two of the deep cuts through the hills.

$3,752,000 Broadway Low Level Tunnel Job Started Work June 17

(Continued from page 16)

impression upon the assembled thousands in the Berkeley hills witnessing the start of a project made possible by the gas tax fund.

Senator Breed, veteran friend of California highways, retiring from the Senate, spoke in similar vein, as did State Director of Public Works Kelly.

Other speakers were E. N. Ament, Mayor of Berkeley; W. J. McCracken, Mayor of Oakland; Hollis R. Thompson, City Manager of Berkeley; W. J. Buchanan, Chairman, Board of Supervisors, Contra Costa County; W. J. Hamilton, Chairman, Board of Supervisors, Alameda County; John B. Lewis, Collector of Internal Revenue; State Senator Will R. Sharkey, Contra Costa County; Redmond C. Staats, Past President and Thos. E. Caldecott, President, Board of Directors, Joint Highway District No. 13.

DREAM COME TRUE

Long the dream of residents of the great Eastshore Empire, the Broadway low level tunnel became a reality. Its inception in 1926 brought about by public demand, due to the inadequacy of the existing tunnel and its connecting traffic lanes, marked a historical date in the life of both Contra Costa and Alameda counties. These two counties were joined by the city of Oakland in a study which resulted in the formation of the 13th Joint Highway District. Assistance was given these bodies by the State Highway Commission.

Some idea of the amount of traffic that used the present antiquated tunnel in 1930 may be gained from the traffic count, which showed 30,000 vehicles per week. Engineers place the probable traffic by 1940, at which time the new Broadway low level tunnel will be in full operation, at 77,000 vehicles weekly.

Without the aid of the United States government and the State of California it would indeed have been difficult for the counties of Alameda and Contra Costa to construct this necessary traffic artery. PWA grant from the Federal government amounts to $1,095,000, while the State of California granted $700,000. The balance of the money was raised successfully by bond issue.

A NOTE OF APPRECIATION

T. H. Dennis, Maintenance Engineer,
California Highway Commission,
Sacramento, California.

Dear Mr. Dennis:

As a community organization, and in behalf of every resident, we thank you for the white line recently painted along the center of our highway from Dolans Corner to the head of Bolinas Lagoon.

Because of the many blind curves this is an important safety feature but to those who drive this road on foggy nights, when it is not possible to see either edge of the road, this white stripe is literally a "life line."

We also express our appreciation of the care given this road since it was taken into the Secondary Highway System. Prompt removal of rock and dirt slides after rains, frequent repairing of such holes as came in the surfacing, and the general attention to drainage and maintenance have given us a new conception of the service given by the State Department of Highways.

It is a pleasant contrast to the road we traveled for many years.

Very truly yours,

PROGRESSIVE CLUB OF STINSON BEACH.

(Signed) W. B. Marble, President.

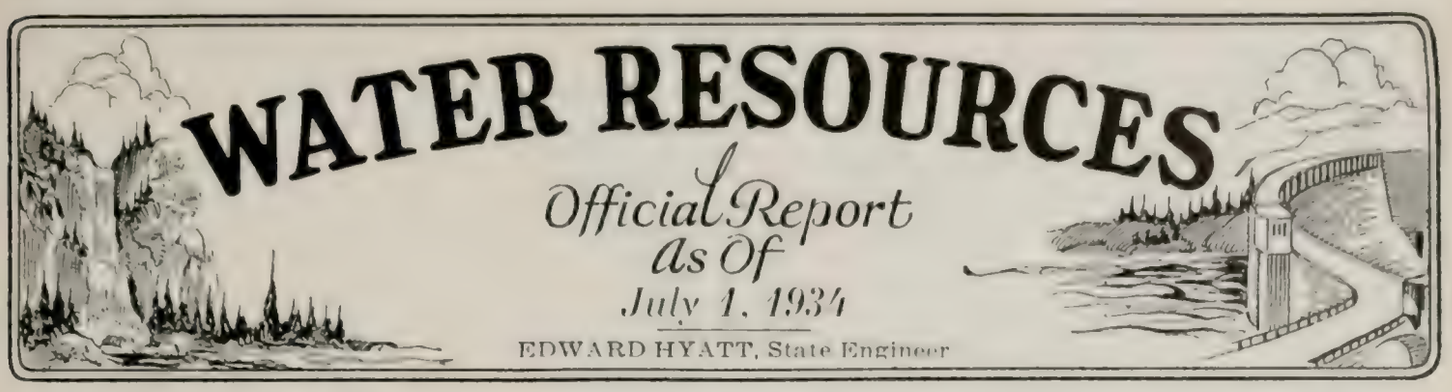
COST $3,752,000

The project will consist of two parallel tunnels having a total length of 3168 feet each. A 22-foot roadway with a 3-foot pedestrian sidewalk through each bore will provide maximum safety and will allow for fast traffic movement.

Both tunnels are to be concrete lined, and mechanically ventilated by a system with a capacity of 1,500,000 cubic feet of fresh air per minute. Complete electric illumination and safety control devices are provided.

The cost of the entire project will be approximately $3,752,000. For a period of 18 to 24 months an average of 900 men will be employed. One hundred twenty thousand barrels of concrete will be used. Over 1000 tons of structural and reinforcing steel will be required. Seven hundred thousand square feet of pavement will be laid. The whole project will require excavation and grading of one million cubic yards of earth.

Mr. Spendix: "Any installments due today?"
Mrs. Spendix: "No, dear, I think not."
Mr. Spendix: "Any payments due on the house, the radio, the furniture, the rugs or the books?"
Mrs. Spendix: "No."
Mr. Spendix: "Then I have ten dollars we don't need. What do you say we buy a new car?"



A newly issued report on the irrigation districts shows that major reservoirs were only half filled in 1933, compared with a storage amounting to two-thirds their capacity in 1932, and total water diversions were 522,000 acre-feet less than in the preceding year. The work of the Sacramento-San Joaquin water supervisor has been resumed through subscription of funds by water users. The flow of the Sacramento River did not drop to anticipated levels during the month and salinity encroachment in the Delta was delayed owing to cool weather and showers in the mountains. Other activities of the division are given in the monthly report as follows:

IRRIGATION DISTRICTS

At an election on June 19th, $2,000,000 in bonds were voted by the Santa Clara Valley Water Conservation District, Santa Clara County. The bonds are to support a Federal loan which will be used for the construction of storage and other water conservation works planned by the district.

Bulletin 21-E, a report by the State Engineer on California irrigation districts for 1923, has been released. This is the sixth of a series of publications issued by the State since 1928 dealing with the history and activities of districts formed under the California Irrigation District Act. This bulletin supplements the previous publications by bringing the statistical data on the irrigation districts up to January 1, 1934, and briefly recording such other information as was obtained of district activities in 1933. One additional district was formed during the year and two districts dissolved. There are 92 districts containing a total of 3,384,000 acres maintaining organizations and listed as active.

Bulletin 21-E contains tabulations for 1933 on the water supply, crops, assessments and collections of the active districts as well as bond information on those having outstanding bonds.

There are 24 major reservoirs in use with a total capacity of 1,525,000 acre-feet. Water stored in 1933 amounted to 737,000 acre-feet, or less than one-half the capacity of the reservoirs, whereas in 1932 storage amounted to two-thirds of such capacity. Total water diversions reported are 6,900,000 acre-feet or 522,000 acre-feet less than in 1932.

The districts operated 302 irrigation and 251 drainage wells, and for all pumping operations reported an installation of 38,549 horsepower. To supplement the water furnished by the districts landowners in the district were reported as operating 11,647 private irrigation wells. There was a decrease of approximately 297,000 acres irrigated in irrigation districts as compared to the previous year.

DISTRICTS SECURITIES COMMISSION

The commission issued orders to the following districts:

La Mesa, Lemon Grove and Spring Valley Irrigation District—Approval for certification of $490,000 in principal amount of second division, second issue, of bonds; also $1,348,000 in principal amount of refunding bonds.

Imperial Irrigation District—Approval of warrant payment plan to be used in connection with the refunding plan previously approved.

Citrus Heights Irrigation District—Consent to expenditure from general fund, pursuant to section 11 of the Securities Commission Act.

FLOOD CONTROL AND RECLAMATION

Sacramento Flood Control Project—Bank Protection.

Work on the State-Federal cooperative program for permanent bank protection has been continued by the U. S. Engineer office at Sacramento. A large order for Folsom cobbles has been placed for bank protection in Reclamation District No. 1500 in Sutter County, District No. 108 in Colusa County and District No. 2047 in Colusa County.

Sacramento Flood Control Project.

Applications are being prepared by this office for the Reclamation Board covering possible SERA projects in the American River overflow channel, the Sacramento By-pass and the Feather River overflow area in Yuba County.

Mokelumne River.

This office has under preparation an application for a SERA project for clearing the Mokelumne River By-pass between Reclamation District No. 1002 and the McCormack-Williamson tract.

Russian River Jetty.

Application is being made for a SERA project to continue work on the Russian River jetty.

(Continued on page 28)

Bay Bridge Six Months Ahead of Schedule Says First Annual Report

A YEAR has elapsed since ground was broken for the San Francisco-Oakland Bay Bridge on Yerba Buena Island, July 9, and in the first annual report on the bridge State Director of Public Works Earl Lee Kelly and Chief Engineer C. H. Purcell had the pleasure of reporting to Governor Frank F. Merriam that the bridge was six months ahead of schedule.

If this lead is maintained, Director Kelly informed Governor Merriam, the San Francisco-Oakland Bay Bridge will be opened to traffic by July, 1936.

The first anniversary of the bridge sees the completion of the first steel tower of the suspension sector and the beginning of erection of the second tower.

WEST BAY PIERS COMPLETE

During the year the contractors on the bridge have earned $11,500,000, or 31 per cent of the total amount of the major contracts.

At the end of the first year of the bridge all the piers of the West Bay crossing are either complete or nearing completion and, of the 22 major East Bay piers, only two are yet to be started.

Of the 51 piers beneath the entire bridge, 16 are complete, 18 are in construction, and the remaining 17 are small subpiers involving no unusual problems or quantities.

The San Francisco cable anchorage on Rincon Hill is now in its secondary stage of construction, containing more than 30,000 cubic yards of concrete, or half its final cubiture. No more concrete will be added to this monument at the west end of the bridge until the cables have been spun and tied to the giant steel eyebars projecting from this monolith, some time in 1935.

ANCHORAGES WELL ADVANCED

Work is now starting on the viaduct to carry the bridge west of the anchorage over Rincon Hill.

Piers to carry the bridge east of the anchorage on the San Francisco side are in construction.

On Yerba Buena Island the cable anchorage is well under way and the concrete center anchorage, midway between San Francisco and Yerba Buena Island, has its substructure in the final stage.

The two huge tunnels, large enough to drive a truck in (but not turn around), into which the two cables will be anchored to steel grillages and concreted, are complete and ready for setting the steel to which the cables will be anchored.

OPENING TUNNEL BORES

The huge vehicular tunnel that will carry two decks of traffic through the sandrock island is well under way with two headings due to go through by July 23, when Governor Merriam and the California Toll Bridge Authority will be escorted through by Director of Public Works Kelly and Chief Engineer Purcell.

The piers supporting the bridge viaduct on the east side of Yerba Buena Island are all practically complete, as is the huge anchor pier on Army Point for the west end of the anchor arm for the 1400-foot cantilever span.

OVER 7000 EMPLOYED

Inasmuch as the East Bay piers are in an advanced stage, erection of the steel superstructure at the east end of the bridge is expected to be started next month.

The sand fill, which is being pumped into place alongside the Key Route Mole, is well ahead of schedule and should be completed this year.

Employment on the bridge has now reached a total of 7238 men of which 4015 are employed fabricating materials, and the balance by the contractors on location.

SURFACING COALINGA LATERAL

On the Coalinga lateral, between Mustang Ridge and Priest Valley, a distance of about 3.3 miles, the road is being constructed with a 24-foot graded roadbed and a 20-foot selected material surface. This project is financed under the National Industrial Recovery Act.

Gladys—What is your favorite sport?
Young Doctor—Sleighing.
Gladys—No, I mean apart from business.

RISING SKYWARD above the city's shoreline, Tower W-2 of the San Francisco-Oakland Bay Bridge presents fascinating studies of majestic beauty and strength to the camera. A side view shows the slender, graceful silhouette tapering from the base to its top 474.35 feet above the water. A worm's eye view presents a vaulting pyramid of steel lattice work. Seen through a second story office window it dominates all the bay front structures, its top almost lost in the cloud vapors. A close-up reveals the massive size of the great steel girders.

Expert Engineers Pass on School Plans

(Continued from page 15)

in providing such reasonable fire safety. However, where such reasonable fire safety is not provided, a school authority is advised that use of the school building for school purposes as far as fire hazard exists will be entirely upon its own responsibility.

4. Where a building belonging to a school district is to be used for housing school buses or such mechanical equipment then such building is not affected by the act provided that a proper resolution is passed by the school board to the effect that no pupils or teachers, as such, will be permitted to use or enter said building at any time.

ENFORCEMENT NOT ARBITRARY

5. The Division of Architecture has further taken the viewpoint that repairs such as painting, reshingling and miscellaneous upkeep do not come under the provisions of the act.

The rules and regulations set up in connection with the act are not being arbitrarily enforced but the way is left open for the designer to exercise his ingenuity subject to the primary consideration of safety of construction. What we are fundamentally concerned with is not a set of rules but rather safeguarding life and property.

The problem has been most difficult in connection with reconstruction work. What we have been primarily concerned with is not whether the minimum requirements prescribed for new construction have been exceeded but rather is the condition which exists such as to create a hazard to the occupants of the building.

The Division of Architecture is being just as liberal as possible consistent with safety in enforcing requirements for reconstruction or alterations of existing buildings.

BUILDING USE PRIOR TO COMPLETION

6. The school board may, if it so desires, submit plans and reconstruction or changes for the entire building or any portion thereof. Approval of this proposed reconstruction or change will be based upon whether or not the building as reconstructed will be hazardous, rather than whether it fully complies with Appendix "A" of the Division of Architecture. The division has, in certain instances, given approval where individual members have been overstressed as much as 50 per cent or more of the values laid down in Appendix "A," provided that an undue hazard is not created thereby.

It will, of course, be necessary that the submitted plans provide such safety as will give assurance that undue hazard does not exist. The school board may, on the other hand, do only such portion of the work, as set forth in the approved plans and specifications, as it may desire or as its financial limitations may permit. Construction may therefore proceed to any point short of full compliance with plans and specifications without doing all the work involved therein, and later, if it so desires, the school board may intermittently or continuously complete the work until full compliance is had.

Upon final completion, but not before, the Division of Architecture will issue a certificate of completion. The question of how far work shall proceed is thus left entirely optional with the school board, since it may discontinue work at any time and proceed to use the building upon its own responsibility.

ADDITIONAL EXEMPTIONS PERMITTED

7. In accordance with a ruling of the Attorney General, permission is being granted to include a number of identical temporary buildings under one application, and minimum fee, provided that the cost of the group does not exceed $10,000.

Whether or not an existing building is to be strengthened is entirely optional with the school board. If any work is done exceeding $1,000 in cost, approval must be had of the State.

It is not necessary to secure approval for repair work such as painting, plastering, and general maintenance of the building. Approval applies only to new work, or to alterations, additions or reconstruction.

Approval for demolition work has been waived. This exemption can not, of course, include those conditions where reconstruction is involved.

PERSONNEL COMPETENCY DEMANDED

Realizing the extreme importance of the work involved the personnel employed has been selected entirely on the basis of fitness as determined by combined written and oral examinations. All persons engaged in this work are civil service employees employed solely on the basis of their individual qualifications and are retained by the State only so long as they are found to be efficient and competent.

The science of design with reference to adequately and economically providing for seismic forces is relatively new and consequently the State's personnel as well as those persons engaged in private practice have had to become trained in this work. Fortunately the State had a small group of structural engineers who had for several years been thus designing State buildings. These were reemployed upon passage of the safety of school construction act and augmented by a number of especially well qualified structural engineers in private practice.

This group served as a nucleus around which the organization was built and served not only to check such plans as were submitted but, in addition, in the work of examination of existing buildings it gave such advice and assistance upon submission of the preliminary scheme of design of plans and specifications as lies within the province of the Department of Public Works.

The ingenuity of both the structural engineer and architect is being taxed to the utmost to provide designs for this reconstruction work that are at all reasonable, economical and feasible. The problems involved are troublesome and solution is not always entirely satisfactory. However much has been accomplished since the act has gone into effect and designs are rapidly being simplified and standardized.

The public can have every assurance that new school buildings as well as those being reconstructed will be safe against earthquakes of rather severe intensity such as have been experienced from major earthquake shocks in the past on the Pacific Coast.

Projects Advanced to Bids in June

Fourteen contracts were advertised by the Division of Highways in June for improvements in nine counties. The projects on which bids were asked included the grading, paving or surfacing of 5.8 miles of highway, the construction of four bridges and two maintenance station buildings and the oiling of 68.2 miles of road oiling on various routes. The estimated total costof the work was $554,200.

DETAILED LIST OF PROJECTS

County	Location	Type	Miles
San Francisco	Between Division & Army Sts. on Potrero Ave. in San Francisco	Pavement	1.4
San Francisco	Between 5th & 10th Sts. on Harrison St. in San Francisco	Pavement	0.8
Humboldt	Broadway Avenue in Eureka	Bit. Tr. Cr. Rk. Surf.	1.5
Kings	23 & 25 Mi. S. of Fresno on Lemoore-Fresno Road	Bridges	(2)
Los Angeles	Across San Gabriel River & Coyote Crk. on Firestone Blvd.	Bridges	(2)
San Bernardino	In Redlands	Storm Drain	----
Napa	Napa to Greenwood Corner	Bit. Tr. Cr. Rk. Surf.	0.6
Orange	Approaches to Santa Ana Riv. Br. at Buaro Road	Graded Roadbed	1.5
Los Angeles	Los Angeles County Park	Maint. Sta. Bldgs.	----
Santa Cruz	Saratoga Gap	Maint. Sta. Bldg.	----
San Bernardino	Mt. Vernon Ave. Viaduct	Painting steel Struc.	----
Los Angeles	Various Routes	Oiling	23.3
San Bernardino	Various Routes	Oiling	28.5
Madera	2.9 Mi. E. of Madera to County Road to Bates	Oiling	16.4

SUMMARY

Type	Miles	Amount
Pavement	2.2	$259,000
Bituminous Treated Crushed Rock Surface	2.1	65,500
Graded Roadbed	1.5	10,000
Bridges	(4)	102,400
Oiling	68.2	37,800
Miscellaneous Projects	---	79,500
Totals	74.0	$554,200

Water Resources for July

(Continued from page 23)

WATER RIGHTS

Supervision of Appropriation of Water.

Thirty-eight applications to appropriate water were received during May, six were denied and 20 were approved. During the month two permits were revoked and 16 passed to license.

Among the applications filed were five by the Department of Finance under the provisions of Chapter 286, Statutes of 1927, in furtherance of the State Water Plan and involving the waters of the American River.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

In response to the appeal to the water users by the Permanent Committee of the Sacramento-San Joaquin River Problems Conference for funds for reestablishment and maintenance of water supervision during the current season, about $5,500 of the $12,500 sought has been paid or pledged. Provision has been made for matching the funds subscribed by the water users with a State Emergency Fund allotment, making about $11,000 available for carrying on the work. Although this may not be sufficient to complete, in addition to the water supervision, the compilation and publication of the Water Supervisor's Report of all data, as in the past, it is sufficient to assure the maintenance of the much needed water supervision throughout the irrigation season. At the request of the Permanent Committee, therefore, the Division of Water Resources has definitely reestablished the work and it is now well under way.

Due presumably to the cool weather and showers in the mountains which have prevailed during the past month, the stream flow has not dropped to the levels anticipated for this date. On June 15th the flow of the Sacramento River at Sacramento was about 3000 second-feet, compared to a flow of about 1200 second-feet on the same date in 1931. The flow of the San Joaquin River near Vernalis is practically the same as in 1931, or about 400 second-feet.

This condition of the stream flow is reflected in the following comparison of the salinity at upper bay and delta stations on June 14, 1934, and 1931:

Comparison of Salinity on June 14, 1934 and 1931

Salinity in parts of Chlorine per 100,000

Station	*1934*	*1931*
Point Orient	1680	1680
Bullshead Point	1040	1280
Bay Point	740	920
Collinsville	190	580
Antioch	130	340
Rio Vista	4	34
Central Landing	7	8

The above indicates that at present the salinity encroachment is from twenty to twenty-five days later than in 1931, and gives rise to the hope that the maximum salinity at the various stations may be considerably delayed and sustained for a much shorter period than in 1931, although the degree of the maximum may closely approach that of 1931 at the lower Delta stations.

DAMS

The application for construction of the Big Canyon Creek Dam, located on Big Canyon Creek in El Dorado County was approved on June 6th. The dam is to be an earthfill 45 feet in height with a storage capacity of 300 acre-feet. The water will be used for mining purposes.

Work on the construction of San Gabriel No. 1 dam is proceeding as is the work of producing settlement in the San Gabriel No. 2 dam by the use of water.

WATER RESOURCES

At the present time the application for the approval of the Central Valley Water Project and for a grant and loan for its construction is before the Public Works Administration in Washington. The application has been reviewed and reported upon by the United States Army engineers and the Federal Power Commission. Application has also been made to the Federal Power Commission for license by that commission for the three dams at Kennett, Keswick and Friant. The Secretary of Agriculture, through the United States Department of Agriculture, has made a study and report of the needs in the San Joaquin Valley of additional water for irrigation and agricultural development. With the report of the Secretary of Agriculture the Federal agencies interested will have reviewed the application for the approval of the Central Valley Project.

WHAT'S THE USE OF RED LIGHTS ILLUMINATED SIGNS N'EVERYTHING?

Four empty whiskey bottles, a man and a woman and a large sedan, Wednesday evening, in Wheatland, successively and successfully passed two "detour ahead" signs, four red lights, one illuminated arrow and a 6-foot barricade 40 feet wide, continued north into the new highway construction until they struck the 4-feet fill made of good red soil and sleeked down by the heavy rains. Then, like the "Strawberry Roan," that car just seemed to "quit livin' down there on the ground." It turned three somersaults, swapped ends and rolled over in the mud.

Officers visiting the scene found the car registered in the name of a resident of Oroville. Outside of some smashed glass the car was not badly damaged. The four whiskey bottles were intact and may be used again.— *Wheatland Herald.*

Angeles Crest Highway Will Open Recreational Mountain Area in Fall

(Continued from page 2)

Although at present there are no definite plans for this section, it will in all probability be constructed within the next few years.

GIVES ACCESS TO MT. WILSON

In the meantime, the U. S. Forest Service has awarded a contract for widening the road from Mt. Wilson to Red Box to a 20-foot roadbed width. This section is five miles in length. When this widening contract is completed, and the State contract between Colby Canyon and Red Box is finished, automobile traffic will have ready access to Mt. Wilson.

GRADING OPERATIONS call for 914,000 cubic yards of roadway excavation, 5,000,000 yards overhaul.

Construction on the new Angeles Crest Highway was commenced in 1929 and has been completed for the first 11¾ miles in three contracts. Easy grades and high standards of alignment for this type of road have been used on all three of the completed contracts as well as the one now in progress.

A 26-foot wide roadbed has been constructed, with standard superelevation on all of the curves so this entire road can safely be driven at a fair rate of speed.

From La Canada the new highway climbs steadily along the precipitous sides of the Arroyo Seco to the divide between the Arroyo Seco and Big Tujunga watersheds.

BEAUTIFUL SCENIC PANORAMA

As the ascent is made, a beautiful vista is unfolded. From certain prominent points a view can be had of Los Angeles, Pasadena, Glendale and many other cities and small towns in the flatter country below. On exceptionally clear days the ocean and Catalina Island can also be seen.

Care was used in planning the construction of this road to avoid making high cut or fill slopes which could be seen from the valley. The beauty of the mountain slopes in the vicinity of Los Angeles (particularly north of Hollywood and Beverly Hills) has been destroyed in many cases by the construction of subdivision streets and roads making unsightly gashes in the forest cover. To avoid these long fill slopes at exposed places, the excess material was hauled farther into the mountains and deposited out of view to make parking places and picnic grounds.

WIDENING OPERATIONS call for heavy work on mountain spurs encroaching on the alignment.

PARKING AREAS PROVIDED

Wherever possible, in the construction of this highway, the scenic points have been graded so as to form areas where cars can park overlooking the valley below.

The new section of the highway now under construction from the end of the completed portion of Colby Canyon to Red Box, is being built to the same standards as the portions already

(Continued on page 31)

Highway Bids and Awards

FOR JUNE

COLUSA COUNTY—Between Maxwell and Delevan, about 5.5 miles to be graded and paved with asphaltic concrete. District III, Route 7, Section C. Chas. L. Harney, San Francisco, $186,719; Peninsula Paving Company, San Francisco, $158,962. Contract awarded to Hanrahan Company, San Francisco, $146,974.

IMPERIAL COUNTY—Oiling, Bonds Corner to Niland. District XI, Route 187-201, Sections A, B, C, E-C. Consumers Oil Co., Los Angeles, $9,319; Gilmore Oil Co., Los Angeles, $9,156; Poulsen & March, Inc., Los Angeles, $8,883; Lambs Transfer, Long Beach, $9,646. Contract awarded to Square Oil Co., Los Angeles, $8,338.

KERN COUNTY—Between Rio Bravo and ½ mile So. of Shafter and between Old Quarry and westerly boundary of Sequoia Natl. Park, about 28.7 miles to be treated with cut-back asphalt road oil and fuel oil. District VI, Routes 139 and 142, Sections B, C & D. E. A. Forde, San Anselmo, $29,275; John Jurkovich, Fresno, $32,880. Contract awarded to Granite Construction Co., Ltd., Watsonville, $26,654.

LOS ANGELES COUNTY—Between westerly city limits and Wilmington Blvd. 2.0 miles to be graded and paved with asphaltic concrete or Portland cement concrete and asphaltic concrete. District VII, Route 60, Section L.A. United Concrete Pipe Co., Los Angeles, $163,736; Griffith Company, Los Angeles, $160,280; Sharp & Fellows Cont. Co., Los Angeles, $167,268; Sander Pearson & Mundo Eng. Co., Los Angeles, $199,177; Oswald Bros., Los Angeles, $153,632; Sully Miller Contracting Co., Long Beach, $167,983. Contract awarded to Basich Bros., Torrance, $150,290.

LOS ANGELES COUNTY—Various locations, 41.1 miles, heavy fuel oil treated shoulders and roadbed and bituminous treated shoulders. District VII, Routes 4 and 186, Sections F, G, H, I, J, D & C. Kovacevich & Price, Inc., Southgate, $42,040; Dimmitt & Taylor, Los Angeles, $40,480; P. J. Akmadzich, Los Angeles; Geo. Herz & Co., San Bernardino, $41,222. Contract awarded to Matich Bros., Elsinore, $38,163.

LOS ANGELES COUNTY—Various roads within Norwalk State Hospital grounds to be treated with heavy fuel oil and surfaced with bituminous treated crushed gravel or stone. W. P. Powell, Los Angeles, $6,762; H. E. Cox & Son, Pasadena, $8,954; Silveria & Robbins, Ventura, $7,208; Griffith Co., Los Angeles, $7,328; Oswald Bros., Los Angeles, $7,077. Contract awarded to Kovacevich & Price, Inc., Southgate, $6,739.

LOS ANGELES AND ORANGE COUNTIES—Various locations, 34.6 miles, roadbed and shoulders, heavy fuel oil treated and shoulders bituminous seal coat treated. District VII, Routes 2, 19, 26, 62, 177, Sections F, B, B, C, B, A. Kovacevich & Price, Inc., Southgate, $30,288; P. J. Akmadzich, Los Angeles, $31,250. Contract awarded to Dimmitt & Taylor, Los Angeles, $29,695.

MODOC COUNTY—Between 14 miles east of Alturas and east limits of Cedarville. Oiling. District II, Route 28, Section C. Tieslau Brothers, Inc., Berkeley, $3,751. Contract awarded to C. F. Fredericksen & Sons, Lower Lake, $3,605.

MONO COUNTY—Between Rte. 23 near Carrington's to Rte. 23 near Rush Creek via Carson's and from Rte. 23 near Hot Creek to Mammoth Ranger Station. About 19.7 miles to be treated with fuel oil. District IX, Routes 111, 112, Sections A, A. Contract awarded to Paulsen & March, Inc., Los Angeles, $6,277.

MONTEREY COUNTY—Between Mustang Ridge and Priest Valley, about 3.3 miles to be graded and portions surfaced with selected material. District V, Route 10, Section C. Young & Son Company, Ltd., Berkeley, $138,575; Granfield, Farrar & Carlin, San Francisco, $121,763; Union Paving Co., San Francisco, $124,990; Dimmitt and Taylor, Los Angeles, $148,989; Mittry Brothers Constr. Co., Los Angeles, $135,600; Sharp & Fellows Contracting Co., Los Angeles, $137,229. Contract awarded to Peninsula Paving Company, San Francisco, $108,515.

NEVADA COUNTY—Between ½ miles E. of Hinton and Floriston, about 3.5 miles to be surfaced with bituminous surfacing. District III, Route 38, Section B. E. A. Forde, San Anselmo, $16,956; Granite Const. Co., Ltd., Watsonville, $18,865. Contract awarded to L. G. Kipp, Sacramento, $15,768.

RIVERSIDE COUNTY—Between Temecula River Bridge and San Diego County line near Aguanga and between Hemet and Sage, oiling roadbed. District VIII, Routes 78, 194, Sections A, B. Lamb's Transfer Co., Long Beach, $5,971; Square Oil Co., Los Angeles, $6,354; Gilmore Oil Co., Los Angeles, $6,525; Paulsen & March, Inc., Los Angeles, $6,909. Contract awarded to Morgan Brothers, Huntington Park, $5,757.

RIVERSIDE COUNTY—In city of Elsinore 1.9 miles of oiling shoulders. District VIII, Route 77-78, Section Esn. George Herz & Co., San Francisco, $2,516. Contract awarded to Matich Bros., Elsinore, $2,189.

RIVERSIDE COUNTY—In city of Perris, about 1.7 miles of oiling shoulders. District VIII, Route 64-78, Section Per. George Herz & Co., San Bernardino, $2,243. Contract awarded to Matich Bros., Elsinore, $1,968.

RIVERSIDE AND SAN BERNARDINO COUNTIES—Between Forest Boundary and Keen Camp and between Dobie Corner and 5 miles North of Adelanto, about 22.7 miles to be treated with fuel oil. District VIII, Routes 64, 145, Sections M, A. Dimmitt & Taylor, Los Angeles, $14,152; Sunset Decomposed Granite Co., Hollywood, $12,336; Gogo and Rados, Los Angeles, $16,964; Geo. Gardner & Sons, Redlands, $12,608. Contract awarded to George Herz & Co., San Bernardino, $11,920.

SAN BENITO COUNTY—Between Tres Pinos and Pinnacles, a distance of 11.7 miles, oil treatment to be applied to existing roadbed. District V, Route 119, Sections C, D, E. L. A. Brisco, Arroyo Grande, $10,243; Granite Constr. Co., Ltd., Watsonville, $7,861. Contract awarded to Walter B. Roselip, San Luis Obispo, $6,836.

SAN DIEGO COUNTY—Between Escondido and Lake Hodges Dam, 5.6 miles to be graded. District XI, Route, Lake Hodges Road. Daley Corporation, San Diego, $113,532; Bodenhamer Constr. Co., Oakland, $110,370; Sander Pearson & Mundo Engr. Corp., Los Angeles, $148,094; V. R. Dennis Constr. Co., San Diego, $219,436; Dimmitt & Taylor, Los Angeles, $121,249; Sharp & Fellows Contr. Co., Los Angeles, $128,195. Contract awarded to R. E. Campbell, Los Angeles, $105,296.

SAN DIEGO COUNTY—Between El Cajon and 1 mile east, about 1 mile to be graded and paved with asphaltic concrete. District XI, Route 12, Sections B, C. Griffith Co., Los Angeles, $23,024; Daley Corp., San Diego, $27,186. Contract awarded to V. R. Dennis Constr. Co., San Diego, $22,136.

SAN LUIS OBISPO COUNTY—Routes 33, 125, 58; 41.7 miles oil treatment to be applied to existing roadbed. District V, Routes 33, 125, 58, Sections E; A, B; A, B. Granite Constr. Co., Ltd., Watsonville, $10,936; Oilfields Trucking Co., Bakersfield, $13,217. Contract awarded to Walter B. Roselip, San Luis Obispo, $7,562.

SAN LUIS OBISPO AND MONTEREY COUNTIES—A total distance of 54.3 miles oil treatment to be applied to shoulders and roadbed. District V, Routes 56, 33, 147. Granite Constr. Co., Ltd., Watsonville, $13,552. Contract awarded to L. A. Brisco, Arroyo Grande, $12,943.

SANTA BARBARA COUNTY—Reinforce concrete slab bridge over existing highway near east limits of city of Santa Barbara, 1—55′ span, 2—35′ spans and 2—11′ end cantilevers. District V, Route 2, Section S.B. Oscar Oberg, Los Angeles, $33,117; Theo. A. Beyer Corp., Los Angeles, $33,245; M. B. McGowan, Inc., San Francisco, $31,909; Herbert M. Baruch, Corp., Ltd., Los Angeles, $37,681; Lynch Cannon Engr. Co., Los Angeles, $33.843; Lindgren & Swinerton, Inc., San Francisco, $31,489; D. J. Reed & J. Maiser, Los Angeles, $36,800. Contract awarded to L. C. Siedel, Oakland, $29,597.

(Continued on page 32)

1,500,000 Cubic Yards Excavation on Link of Mountain Highway

(Continued from page 20)

Aside from any economic consideration the new road makes possible an easy strain-free trip through this delightful mountain scenery. The location is a radical departure from the old road. It provides a larger scope of scenic advantages and meets all the requirements of high standards in design.

Structurally, the work is excellent in conception and in craftsmanship. Only a few years ago the plan as executed would have seemed too bold, even fantastic—at least involving too much heavy work and expense.

LARGE EXCAVATION JOB

This job involved earth excavation approximating 200,000 cubic yards per mile. Most of the cutting was in sandstone of medium hardness, with a few cuts in shale. Design was predicated on encountering comparatively few locations where clay strata would involve heavy slide risks, and the preliminary conclusions were supported by the realities of construction. Many of the cuts and fills range between 50 and 80 feet in depth and the cut slopes stand at ¾: 1 in the heaviest excavations.

While the project as a whole was conceived and executed under the guidance of economic and engineering controls, esthetic considerations were factors of weight in all the planning. The motorist will find that this splendid stretch of road is itself artistic in its graceful sweep of line, its nice balances in section and general fitness to the topography.

IN THREE CONTRACTS

Reconstruction of this important section of Route 5 through the Santa Cruz Mountains was done in two grading contracts, and one surfacing contract. The major project extended from Inspiration Point six miles toward the city of Santa Cruz and involved earth excavation in excess of one and one-quarter million cubic yards at a total cost to the State of $313,591. The work was commenced in October 1932 and completed in October 1933.

A second contract involving more than one-quarter million cubic yards excavation extended the construction seven-tenths mile towards Los Gatos. The cost to the State for this second unit was $83,080 and the work was completed in May, 1934.

The third contract for surfacing the two grading jobs has been awarded. The work consists of placing crusher run base and bituminous macadam at a cost to the State of $191,228. This work is now under way and will be soon completed.

Angeles Crest Work Has Averaged 125 Jobs for Five Years

(Continued from page 29)

completed. Parking areas are being graded on scenic points as was done on previous contracts.

The width of the roadbed will be 30 and 40 feet. This 3.96 mile length will cost approximately $300,000. The contract allotment provides for 914,000 cubic yards of roadway excavation and 5,000,000 station yards of overhaul. Two power shovels have been employed part of the time, and three the rest of the time since early last October.

The time limit on this contract was set at September 26th and, from present indications, will be completed by that time.

RELIEVED UNEMPLOYMENT

A light type oil surfacing will be mixed in place on the roadbed and parking areas as was done on previous sections.

Practically all of this Angeles Crest Highway has been constructed during depression times and the employment which it has afforded has meant a great deal to men who have been employed in its construction. An average of about 125 men has been employed on the various contracts during the last five years. Since most of these men had dependents, it is safe to say that two or three times this number of people were benefited either directly or indirectly by the employment furnished by this project.

This project is of great importance to southern California, particularly to the metropolitan area around Los Angeles. Its completion will render the roads which have been already built in Angeles National Forest readily accessible to automobile traffic from Los Angeles and neighboring cities.

These Forest Service roads (lower standard roads) in turn extend into a vast hitherto inaccessible area in the high mountains which will be ideal for recreational purposes, both from the standpoint of altitude and scenery and from the standpoint of accessibility.

Channel Change and 4 Bridges on Project in Santa Barbara

(Continued from page 4)

consists of constructing a new channel with a 20-foot bottom about 9 feet high and lining with mesh reinforced concrete 8 inches thick on the base and 6 inches on the walls.

The four bridges mentioned above are being constructed under separate contract and under the bridge department supervision. The first of these structures is a reinforced concrete slab bridge over the present highway at the southerly city limits. This structure will provide a clear roadway width of 44 feet with two 4-foot sidewalks.

TWO BRIDGES OVER CREEK

The two bridges being built across Mission Creek provide a clear roadway width of 60 feet with two 4-foot sidewalks.

At the northerly edge of the city, where the new road parallels the railroad, it has been necessary to construct a reinforced concrete girder type overhead structure to carry a well traveled county road, this structure directly connecting to an existing timber bridge over the Southern Pacific railroad.

At the northerly end of the work, where a connection is again made with the present State highway on Hollister Avenue, additional right of way has been acquired to permit the future construction of a braided traffic intersection to effectively handle the ever increasing volume of traffic in this vicinity.

RELIEVES CONGESTED TRAFFIC

The roadway work is progressing under two contracts and the structures under three contracts, all work being under the provisions of the National Industrial Recovery Act, stipulating a maximum employment of Santa Barbara County workmen, and providing for a 30-hour working week.

The entire improvement on this Santa Barbara through truck boulevard aggregates a total contract price of over $500,000, and when opened, which is expected will be about November 1st, will provide an adequate by-pass of the business section of Santa Barbara and allow through traffic of the Coast Highway to proceed through the city with the minimum of inconvenience and delay. It will also be of a decided benefit to the city itself, as it will relieve, to a great extent, the congested traffic conditions along de la Vina and other narrow streets within the community.

In Memoriam

CHARLES H. GREENWALD, maintenance foreman of District VII, died on June 16th following an abdominal operation at a hospital in Santa Ana, Orange County, at the age of forty-seven.

He was born in 1887 at Fort Scott, Kansas. He entered the service of the State Division of Highways as a laborer March 17, 1924, and served in that capacity until July 19, 1927. He was promoted to the positions of leadingman and maintenance foreman and served in the latter capacity continuously until his death. He was a very reliable and conscientious employee and his passing is deeply regretted by all his associates.

Mr. Greenwald had his home at Seal Beach and leaves a widow and three children. One of his sisters is the wife of Maintenance Foreman C. J. Ward, at Azusa, California.

COAST HIGHWAY IMPROVEMENTS

On the Coast Highway between King City and two miles south of Greenfield, a distance of 8.9 miles, the road has been graded to a 36-foot roadbed with a 20-foot bituminous surface treatment. This project was financed under the National Industrial Recovery Act.

Between King City and San Ardo, a distance of 15 miles, fuel oil has been applied as a dust palliative to the shoulders on each side of the existing pavement.

Highway Bids and Awards

(Continued from page 30)

SHASTA COUNTY—Bridge across Sacramento River at Redding. Construction of 6—108′ pl. gird spans and 2—73′ 6″ end spans on concrete piers. District II, Route 3, Section B. M. B. McGowan, Inc., San Francisco, $171,532; Lindgren and Swinerton, Inc., San Francisco, $178,621; Gist & Bell, Los Angeles, $199,560; Rocca & Caletti & J. P. Brennan, San Rafael, $170,980; Ward Engineering Company, San Francisco, $202,925. Contract awarded to J. F. Knapp, Oakland, $168,847.

TEHAMA COUNTY—Treating with heavy fuel oil between Rte. 3 and 1½ miles east of Dales. District II, Route 29, Section A. Helwig Constr. Co., Sebastopol, $4,975; E. A. Forde, San Anselmo, $5,301; E. F. Hilliard, Sacramento, $5,324. Contract awarded to A. Teichert & Son, Inc., Sacramento, $4,766.

VENTURA COUNTY—Between Ojai and westerly boundary, about 42.1 miles in length, to be treated with heavy fuel oil as a dust palliative. District VII, Route 138, Sections B, C, D, E. Gilmore Oil Co., Los Angeles, $8,851; Oilfields Trucking Co., Bakersfield, $9,116; L. A. Brisco, Arroyo Grande, $9,487; Paulsen & March, Inc., Los Angeles, $9,752; Western Motor Transfer, Inc., Santa Barbara, $10,229. Contract awarded to Consumers Oil Co., Los Angeles, $8,480.

YOLO COUNTY—Between 2.3 miles E. of Woodland and 0.8 miles W. of Elkhorn Ferry, 319 miles to be surfaced with pit run gravel base. District III, Route 50, Section E. Albert G. Raisch, San Francisco, $17,965; Poulos & McEwen, Sacramento, $11,910; Tieslau Bros., Inc., Berkeley, $14,920; A. Teichert & Son, Inc., Sacramento, $18,475; J. R. Reeves, Sacramento, $14,582; Hemstreet & Bell, Marysville, $14,370; Sunset Decomposed Granite Co., Hollywood, $14,905; Peninsula Paving Co., San Francisco, $16,975; Lloyd G. Kipp, Sacramento, $14,480; George J. Fraites, Oakland, $14,220. Contract awarded to Garcia Construction Co., Irvington, $10,325.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM ..... Governor

EARL LEE KELLY ..... Director

DIVISION OF HIGHWAYS

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T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding
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J. H. SKEGGS, District IV, San Francisco
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FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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CALIFORNIA STATE PRINTING OFFICE
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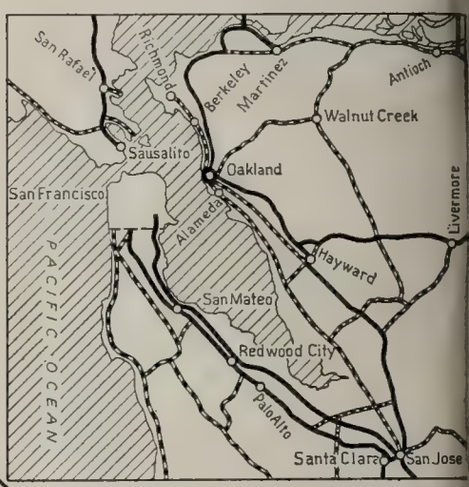
SACRAMENTO, 1934

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM
1933

LEGEND
Primary Roads
Secondary Roads



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CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

"M" Street Vertical Lift River Bridge at Sacramento. A Unique Design with Architectural Treatmen

Official Journal of the Department of Public Works
AUGUST ~ 1934

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Governor Merriam Declares Power Development

Must Not Be Divorced From

State Water Plan

By **FRANK F. MERRIAM,** Governor of California

NEGOTIATIONS with the Federal government for the financing of our $170,000,000 State Water Plan, which is of the greatest concern to the people of California, appear to be in a critical stage. According to a newspaper statement from Washington the Public Works Administration is preparing a report of its investigation of the Central Valley Water Plan as submitted by our State Division of Water Resources. It is said that this report finds the project both feasible and advisable as to its flood control features and as an aid to navigation and salinity control in the Delta region, but recommends further study of the financial setup of the project and the economic consequences to the State and nation of power development with the possibility of its consideration in the long range Public Works Administration program of the government.

FRANK F. MERRIAM

It therefore appears that we have one more hurdle to jump in Washington before we can secure the full measure of Federal participation in this plan for aiding the great valleys of California that have been improved to a high degree of agricultural production by the toil and capital investment of our citizens, but are fast becoming desert again for lack of water.

The people voted for this Central Valley Water Plan in a statewide referendum election held in December, 1933, and I hold it is just as sacred a duty for the Governor to carry out the will of the people expressed in that majority referendum vote as it is to obey the mandate of any law enacted by the Legislature. It is for this same reason that I oppose the diversion of the gas tax for any other purpose than road building, as mandated by the people in another referendum vote.

The progress and prosperity of the whole State of California are vitally linked with the well-being and prosperity of every section of our State and the great central valley areas can not be permitted to revert to desert for lack of water and cheap electric power.

Therefore, as the Governor of all California, I hold it my solemn, sworn duty to protect and safeguard the interest and prosperity of the State and people of the great central valleys in this issue, just as much as it was my duty to protect the property and interest of the State and the people of San

(Continued on page 14)

Three Highway Tunnels Will Pierce Rock Barriers in Feather River Gorge

By **F. W. HASELWOOD,** District Engineer

THROUGH the rugged canyon of the North Fork of the Feather River and its tributaries, the East Branch and Spanish Creek, the construction of the long heralded Feather River Highway is entering its last lap. On this great and important project construction work has been in progress as rapidly as the financial ability of the State would permit for six years.

Two more years at the somewhat accelerated rate of progress now being attaned will see the completion of this low level, snow free highway between Oroville, famed for its production of gold, oranges and olives, and Quincy, the county seat of Plumas County, located in the heart of one of the most attractive regions of the Sierras.

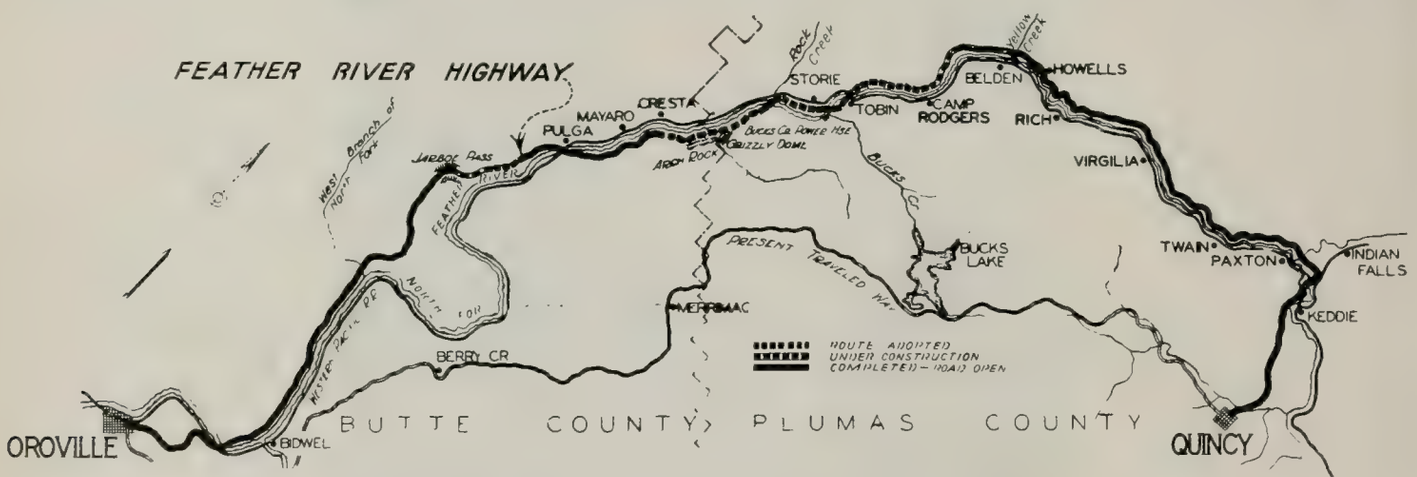
The legal necessity for this highway is created by the original bond act of 1910 requiring that all county seats be served by the highway system then contemplated. The actual necessity is found in the vast area in Plumas, Lassen and Sierra counties that will be served by this direct connection to the Sacramento Valley, and in the ease with which not only residents of the Valley but all of Northern California can reach this unexcelled vacation and outing area.

INTERSTATE ROUTE

The necessity and importance of this highway was further increased in 1931 when the road from Quincy east through Portola, Beckwith and Beckwith Pass to a connection with Route 29, eight miles from the Nevada line, was made a State highway, thus transforming it into a major interstate route. Traversing as it does the river canon and crossing low passes, this interstate route offers less obstruction from snow during the winter than any other trans-Sierra highway.

The distance from Oroville to Quincy by way of the North Fork of the Feather River is 77.75 miles, of which 70.75 miles is being built as a single project, no portion of which is of appreciable value until the whole is completed.

From May to November traffic to Quincy and surrounding territory is served by the ridge road by way of Merrimac and Bucks Lake. During the remainder of the year, when this road is closed by snow, traffic may reach the interior valley by way of Reno, Truckee and Auburn, with an increased length of travel of about 85 miles.



SKETCH MAP of Feather River Canyon Route.

WORK STARTED IN 1928

Grading and structures on this 70.75 miles between Oroville and the existing road at Keddie, seven miles from Quincy, will cost about $7,000,000. At the end of the current biennium approximately $6,000,000 will have been expended.

Work was started on this project April 27, 1928, by establishment of a convict camp on the East Branch near Paxton. A month later

(Continued on page 22)

TWO TOUGH SPOTS for highway building are encountered in the GRIZZLY DOME and ARCH ROCK areas of the Feather River Canyon Route. Three tunnels are necessary, two in the ARCH ROCK area as shown by dotted lines in the upper picture and one through the dome-shaped granite mass of GRIZZLY DOME rising sheer some several thousand feet from the river's edge.

Great Caravan and 10,000 Participants Mark 2 Redwood Highway Dedications

HEADED by Governor Frank F. Merriam, Director of Public Works Earl Lee Kelly, Chairman Harry Hopkins and members of the Highway Commission, and Grand Marshal Harry Ridgway, some 10,000 highway enthusiasts paticipated August 5th in the celebration and monster caravan, commemorating the official dedication and opening of the Waldo-Sausalito and Cloverdale-Hopland sectors of the Redwood Highway.

State highway officials declared that the caravan was one of the largest and the celebration and ceremonies among the most spectacular ever held in California.

The day's events were sponsored and mobilized by the celebrations committee of the Redwood Empire Association, H. G. Ridgway, chairman, with the cooperation of the Mayor and Chamber of Commerce of Sausalito, the mayor and Chamber of Commerce of Cloverdale, D. G. McMillan and Judge Don Ward of Hopland, and a number of city and county chambers of commerce throughout the nine counties.

DINNER TO GOVERNOR

The week end's events commenced with an informal dinner tendered Governor Merriam, Director Kelly and members of the Highway Commission at Sausalito by the city officials, Lions Club and Chamber of Commerce of Sausalito.

Sunday's events commenced with a program and ceremonial in Sausalito's historic plaza—dedicating the Waldo-Sausalito sector.

This was immediately followed by an unique "barrier-breaking" ceremony. A sailing yacht and a power boat—typical of Sausalito's outdoor sports attractions—were placed anglewise across the new Waldo-Sausalito highway sector, with a "barrier" of redwood boughs strung between the two boats.

Signalizing the opening of this highway to traffic, Governor Merriam's car was driven through the barrier. Simultaneously, an attractive Sausalito sailorette crashed a bottle of Napa County wine on the bow of one of the boats.

Sausalito arrangements were in charge of the mayor and Chamber of Commerce of Sausalito, including Mayor Webb H. Mahaffey, Captain W. T. Dillon, president of the Chamber of Commerce; Dick Lewis, Henry Meyer, W. Robert Miller, Andy Anderson, Manuel Monetti and others.

General Chairman Harry Ridgway presented Judge Paul Helmore as master of ceremonies for the Sausalito festivities.

The caravan, which was mobilized during the speaking program by the State Highway Patrol and Sausalito Police Chief Manuel Monetti, then started its historic pilgrimage to Cloverdale and Hopland.

En route delegations were picked up in San Rafael, Novato, Petaluma, Cotati, Santa Rosa, Windsor, Healdsburg and Asti. Petaluma arrangements were in charge of L. J. Peterson, Sam Brown and Dolph Young, secretary of the Chamber of Commerce.

REFRESHMENTS AT SANTA ROSA

At Santa Rosa, a brief stop was made to enjoy refreshments served by the Santa Rosa Chamber of Commerce, in charge of Mayor George R. Cadan and G. Lansing Hurd, secretary.

On arrival at Cloverdale, American Legion drum corps from Healdsburg, Cloverdale, Hopland and Ukiah, together with the Lytton Boys' School band, led the procession over Cloverdale's gaily decorated main street. Several hundred more automobiles joined the cavalcade at Cloverdale. Cloverdale arrangements were in charge of Mayor R. M. McClelland and President of the Chamber of Commerce Hilmer Peterson.

Continuing on schedule, the monster cavalcade proceeded over the newly completed Cloverdale-Hopland sector, one of the most spectacular and panoramic highway units in the State highway system.

As the motorcade passed majestic "Squaw Rock," Pomo Indians by smoke signals informed Hopland that the caravan approached.

BARRIER OF HOP VINES

Arriving at the outskirts of Hopland, the caravan was stopped by a substantial "barrier of hops," made of interwoven hop vines.

With some difficulty Governor Merriam cut this "barrier" with a pair of large pruning

(Continued on page 6)

OPENING DAY CARAVAN passing Squaw Rock on the new Cloverdale-Hopland sector of the Redwood Highway Sunday, August 5th. Inset shows another portion of this fine modern highway along the Russian River.

Thousands Greet Governor at Hopland

(Continued from page 4)

shears, thus officially opening the new Cloverdale-Hopland unit to the public at large. The American Legion drum corps and Lytton band escorted the caravan into Hopland.

The official guests and speakers were entertained at luncheon by the Parent-Teacher Association, The Ladies' Catholic Guild and the Farm Center of Hopland.

An elaborate speaking program followed, broadcast to the many thousands assembled under a bright blue sky by a public address car.

Included in the assemblage were Federal, State, county and city officials, automobile club representatives, newspaper publishers, chambers of commerce and other organization representatives and a host of other officials and leaders from various parts of the Pacific coast.

Immediately following the speaking program, colorful Indian ceremonials were staged, under the direction of Hopland Chairman D. G. McMillan—reminiscent of yesteryears before the coming of the white man.

BREAKING THE FIRST BARRIER at Sausalito, Governor Merriam and Director Earl Lee Kelly at left wave the caravan on its way between two yachts manned by jaunty sailorettes.

NOTABLE LIST OF SPEAKERS

Speakers during the day's events included Governor Frank F. Merriam, Earl Lee Kelly, Director of Public Works; Harry A. Hopkins, Chairman California Highway Commission; Timothy A. Reardon, Highway Commissioner from San Francisco; Dr. W. W. Barham, Highway Commissioner from Yreka; M. Goldman of Petaluma, President of the Redwood Empire Association; C. H. Sweetser, engineer U. S. Bureau of Public Roads; A. E. Dalton of Eureka, Chairman Nine-Counties Highways Committee, Redwood Empire Association; Colonel John H. Skeggs, District Engineer, Division of Highways (San Francisco); State Senator Charles F. Reindollar of Marin County, State Senator Herbert Slater of Sonoma County, State Senator R. R. Ingels of Mendocino and Lake counties, State Assemblyman Hubert Scudder of Marin and Sonoma counties, Assemblyman M. F. Burns of Mendocino, Humboldt and Del Norte counties; Frederick Thompson, supervisor of Marin County; Ed. Gordon, chairman Mendocino County board of supervisors; Ed Enzenauer, chairman Sonoma County board of supervisors; R. M. McClelland, mayor of Cloverdale; W. F. Whitney, secretary Mendocino County Chamber of Commerce; J. P. Kelly, president Associated Chambers of Commerce of Sonoma County; Supervisor John Ratto of San Francisco; E. W. Kramer, Regional Engineer, U. S. Forest Service; C. C. Cottrell, California State Auto Association; H. L. Holley, Auto Club of Southern California, and John Casey, city engineer of San Francisco.

The newly completed Waldo-Sausalito and Cloverdale-Hopland sectors eliminate two of the worst "bottlenecks" and traffic hazards in the State highway system.

INTERESTING DATA

District Engineer John H. Skeggs of District IV, which includes both projects, received high commendation for the splendid job of engineering and construction executed under his direction.

The new Waldo-Sausalito sector in Marin

(Continued on page 26)

CROWDS AND CARS filled every available inch of space around the speakers' stand at Hopland, the northern terminus of the new road where the caravan ended its 15 mile journey. An elaborate program followed, during which Governor Merriam, the principal speaker, was given a great ovation.

HOP VINES ARE TOUGH as Governor Merriam discovered as he sheared the barrier. Front row, left to right: Highway Commissioners Barham and Reardon; the Governor; Miss Redwood Empire, Director Earl Lee Kelly and Chairman Harry A. Hopkins of the Highway Commission.

Western State Highway Officials Urge Imposts on Diesel and Airplane Fuel

By **R. H. BALDOCK,**
State Highway Engineer of Oregon and Secretary-Treasurer Western Association of State Highway Officials

THE Fourteenth Annual Convention of the Western Association of State Highway officials was held at Seattle, Washington, on July 5, 6 and 7, with every one of the eleven western States represented by delegates.

The convention was opened with addresses of welcome by Mayor Charles L. Smith of Seattle and Governor Clarence D. Martin of the State of Washington, to which President T. S. O'Connell of the association responded.

In the first address of the meeting Leslie M. Scott, chairman of the Oregon State Highway Commission, speaking on "Highways of Progress," traced the development of highways since the invention of the wheel and eulogized the Roman roads, which were built straight toward their objectives and have lasted twenty-three centuries. He called attention to the fact that 100 years ago the highways had all the traffic, until 60 years ago, when they were superseded by the railroads.

During the past two decades rapid strides have been made in highway development and the highways have again become the most important means of transport of passengers and commodities. With relation to the present conditions, quoting Mr. Scott:

"RAILROAD METHODS OBSOLETE"

"Railroad executives fuss and fume. They cry that highway vehicular traffic must be curbed by law from taking railroad business. They scold and bedevil legislatures. Harried by debts and labor rules, high costs and slow facilities, obsolete and heavy equipment, they demand higher rates of transport to their own growing loss. Their old ideas of monopoly, heavy equipment, perpetual capitalization, disregard of repayment of debts, are bringing them ruin. * * * Their efforts are as vain as that of the Persian king, whose soldiers lashed the offending waves of the ocean with whips. Present methods of the railroads are obsolete. Maybe the next generation of executives will be less devoted to old idols and better prepared to meet modern exigencies."

Mr. Scott called attention to the necessity of correct and final locations free from political interferences of all kinds, and to the need for forward-looking executives in the design and construction of road systems to the end that alignment, gradient, sight distance and the superelevation and spiraling of curves would permit speeds of from 80 to 100 miles per hour. He called attention to the two divergent theories of Telford and McAdam, starting 100 years ago, and spoke in favor of Telford's idea of building heavy foundations under all types of surfacing as preferable to the idea of John Loudon McAdam of building thin surfaces over yielding subgrades.

NATIONAL POLICY ASSURED

O. S. Warden, chairman of the Montana State Highway Commission and President of the American Association of State Highway Officials, speaking on "National Legislation," said: "Until the national government began to contribute and became a partner, road building in the United States was a disconnected, desultory and hesitating enterprise."

The most forward legislation yet enacted by Congress, Mr. Warden stated, is the Hayden-Cartwright bill that provides for a three-year program, which is a distinct accomplishment in highway economic planning and an assurance that road building will continue as a national policy. Congress has also given full and ample notice to the states that they can not further divert highway revenue to other than road building purposes without suffering forfeiture of a large percentage of their government allotments. Mr. Warden pointed out that it is indeed high time for the enactment of this regulation because the State legislatures of 1933 chiseled road revenues in an alarming fashion.

Mr. Warden called attention to the fact that government grants could not continue indefinitely and it was much better for the states to return to the matching basis. The speaker called attention to the broadening of the scope of government expenditure outside of a Federal system of roads initiated in the grant of 1933 and stated that whether this policy of the government would continue is an open question, but rather inferred that it is quite probable the government will take more active interest in farm-to-market roads and provide matching money for their construction and improvement.

Mr. Warden commended the states for the rapidity with which work had been placed

Million Men Employed at Peak Operations on Federal Aid Roads

under contract and men furnished with employment in this national emergency. Nearly a million men were employed directly and indirectly at the peak of the operation. The record made by the expenditure of the emergency grant funds cleared the way for the three-year program just passed by the last Congress.

Assistant State Highway Engineer George T. McCoy of California spoke in memory of James Allen, former State Highway Engineer of Washington, under whom Mr. McCoy served for many years as Assistant State Highway Engineer of Washington.

Dr. L. I. Hewes, Regional Director of the U. S. Bureau of Public Roads, spoke on "Highway Development for the Whole State" and gave some very interesting statistics, a resume of which is as follows:

Since the original Federal Aid Act of 1916 and, in fact, practically since the subsequent Federal Highway Act of 1921, the Federal aid system in the eleven western states has reached a total of 37057 miles upon which $340,000,000 of Federal money has been expended; this in contrast to the expenditure of $1,843,600,000 expended on approximately 108,000 miles of road of a total mileage of 206,000 in the entire system. The corresponding cooperation by the western states has been about $180,000,000 or 34 per cent of a total of approximately $520,000,000. This expenditure has been made on approximately 20,280 miles of the Federal aid system, representing an expenditure of approximately $26,000 per mile.

$509,000,000 FEDERAL AID

During the past nine years the gasoline imposts alone have equaled $510,000,000; the registration fees $266,000,000, or a total road operating revenue in the eleven western states in the past nine years of $776,000,000. The government has also built directly, through the Bureau of Public Roads, 5800 miles of forest roads costing $123,000,000 and 1200 miles of national park roads costing $37,000,000. The expenditure on public lands highways has amounted to $9,800,000. In consequence the total Federal expenditure on roads in the West to July 1 of this year amounts to approximately $509,000,000, distributed on 29,000 miles of road.

Dr. Hewes pointed out that in a short time there will be left a very few miles of wholly unimproved road on the present Federal aid system of the western states. The time has now arrived for the states to study and classify all their highways with respect to service and revenues. There is no question but that strong sentiment exists for throwing a greater burden of mileage upon the State highway system or for turning a larger mileage over to the control and financing of the states. He stated that in his opinion (which I believe is shared by all thinking men) it is far better for new roads to be brought into the State highway system rather than to split the road revenues for the addition of new roads without State control.

Dr. Hewes stated that it is increasingly clear that there is an obligation against the road revenues for the extension of State roads into the cities and called attention to the inadequate roads in metropolitan areas and to the very heavy tax burden borne by the urban motorist. However, "road revenues spread too thin over either urban or rural roads will compel highway depreciation because it is fundamental that our whole improved mileage is absolutely dependent upon organized maintenance under efficient technical control."

Based on traffic data gathered in Michigan, it would appear that of a total mileage of roads in the eleven western states, amounting to approximately 530,000, 30 per cent or 159,000 can be tentatively termed general use roads with prior claims on road revenues. Of this mileage about 69,000 are on the State systems, leaving a balance of approximately 90,000 miles of general use roads not on the State systems.

(Continued on page 31)

RESOLUTIONS ADOPTED BY WESTERN STATE HIGHWAY OFFICIALS AT CONVENTION

The convention of the Western State Highway Officials held in Seattle, July 5, 6 and 7, 1934, adopted a number of resolutions dealing with highway matters in the eleven western states. A summary of the more important resolutions follows:

1. That cooperation be extended to the legislative and administrative bodies of the western states by the Western Association to result in the common good.

2. That the association recommend to the respective legislatures of the eleven western states that fees for licensing motor vehicles operated by Diesel fuels and/or other similar fuels be correspondingly and equitably increased.

3. That the appreciation of the association be extended to Senator Carl Hayden of Arizona and to Congressman Wilbur Cartwright for their untiring efforts in support of the Hayden-Cartwright bill.

4. That the Western Association of State Highway Officials endorses the State and regional planning boards and pledges its aid and support.

5. That the American Legislators Association at Salt Lake City having adopted a resolution recommending the construction of test roads in the western States for the purpose of obtaining further facts pertaining to highway design and cost, it is resolved that the matter be referred to Thomas H. MacDonald, Chief of the Bureau of Public Roads, with the suggestion that such test roads be constructed.

6. That the Western Association recommend to their respective legislatures that proper legislation be enacted to the end that fees be collected from airplane fuel and expended for the construction and maintenance of airports and roads connecting the air fields with the trunk highway system and that such expenditures be made under the direction of the various State highway departments.

El Camino Cabrillo, New Highway to Point Loma Officially Opened to Public

By **W. L. McFADDEN,** Associate Highway Engineer

ON MONDAY, July 16, 1934, San Diego, in a fitting and proper way, celebrated its official 165th birthday. It was the anniversary of that day long ago when Father Junipero Serra founded the first settlement in what is now California.

Before Father Serra was born, Cabrillo, a Portuguese seaman in the employ of the Spanish kings, explored San Diego Bay with the thought of establishing a base for the galleons from the Philippines.

On beautiful Point Loma, past which Cabrillo sailed into the bay, Director of Public Works Earl Lee Kelly officially opened to the public on July 17, 1934, the newest completed State highway in San Diego County, named in honor of the first explorer—El Camino Cabrillo.

In the presence of prominent Federal, State, county and city officials and hundreds of residents from San Diego, Colonel Ruhlen, commanding officer of Fort Rosecrans, assisted by General William Gatchell, who commanded the fort when the old road was built, cut the ribbon and dedicated the new road to the residents of California.

DIRECTOR KELLY SPEAKER

Mr. Kelly extended greetings from Acting Governor Merriam and complimented the people of southern California on their cooperation in obtaining this new road.

Frank Forward, chairman of the San Diego Chamber of Commerce Highway Committee, was master of ceremonies. He introduced and called upon some of the following for short addresses: President John L. Fox, of the San Diego Chamber of Commerce; Harry C. Clark, chairman of the National Highway Committee; Supervisors Tom Hurley and Edgar F. Hastings; City Manager Fred Lockwood; State Senator William Harper; Congressman George Burnham; State Assemblymen George B. Bowers, Bruce R. Stannard, and Charles W. Stream; former Senator Leroy Wright, president of San Diego Historical Society, and General F. S. Strong, State SERA Director.

Colonel John R. White, superintendent of El Cabrillo monument, Yosemite and Sequoia National Parks, was represented by Assistant Superintendent Daniel J. Tobin. Mr. Tobin told of the efforts being made to obtain an allotment of $35,000 from the Federal government for further improvement of the monument park.

The new highway just completed is 2.7 miles long and extends along the high bluffs of Point Loma to El Cabrillo Monument encircling the old Spanish lighthouse. It comprises the first improvement by the Division of Highways on this unit of the State highway system which is one of the new secondary routes added to the system by the last Legislature.

The work consisted of constructing a bituminous treated surfacing 20 feet wide on a 36-foot graded roadbed and was completed at a cost of approximately $57,550.

As the project lies within the limits of the Fort Rosecrans Military Reservation, Federal funds, apportioned to California for highway construction through National Public Lands, were used in addition to State funds for financing the project.

JOBS FOR SEVENTY MEN

The construction of this new highway unit has furnished employment to an average of seventy men since the work started. Labor was furnished by the reemployment bureau in San Diego. The contract was awarded by Mr. Kelly on January 17, 1934.

The completed section extends from the San Diego city limits to the old Spanish lighthouse. At the lighthouse a large surfaced parking area has been provided so that the public may conveniently view the unexcelled seascape from this vantage point.

9,152,282 MILES OF HIGHWAYS IN WORLD. U. S. HAS ONE-THIRD

A survey just completed by B. P. Root of the Department of Commerce shows that the United States has one-third of the total highway mileage of the world.

His survey covers 145 countries and political subdivisions and shows a total of 9,152,282 miles and 3,042,780 for the United States.

Russia is second with 1,682,109 miles of highways recorded. Japan is third with 635,399 miles of highway.

EL CAMINO CABRILLO is the historic name of the new highway just completed along the bluffs of Point Loma through the National Monument Park to the old Spanish lighthouse at the entrance to San Diego Bay.

OFFICIAL DEDICATION GROUP at the opening of Point Loma Highway. Left to right: Supervisor Ed Hastings of San Diego County; Congressman George Burnham; Director Earl Lee Kelly of the Department of Public Works; President John L. Fox, San Diego Chamber of Commerce; Frank Forward, master of ceremonies; Col. George Ruhlen, U. S. A., commanding officer of Fort Rosecrans; Assistant Superintendent D. T. Tobin, National Park Service; Mayor John Forward of San Diego and Supervisor Tom Hurley.

OLD SPANISH LIGHTHOUSE at the extreme end of Point Loma. The new highway provides wide parking areas where motoring visitors can enjoy a striking panorama of sea and coastline.

Santa Monica Coast Highway Widened to 80 Feet Eliminating Bad Bottleneck

A HAZARDOUS "bottleneck" on the Santa Monica coast boulevard was eliminated on July 2d when with picturesque ceremonies Director Earl Lee Kelly formally dedicated and opened to public use the newly widened and paved link of State Highway No. 60, extending from Santa Monica Canyon along the Palisades Beach to the California Avenue incline, approximately a mile in length.

The traffic on this highway is the greatest of any in the State, with a count of 53,000 cars in 16 hours just westerly of Channel Road at the mouth of Santa Monica Canyon.

UNLOCKING THE BARRIER, Director Earl Lee Kelly dedicated the improved Santa Monica Coast Highway unit along Palisades Beach July 2d assisted by Oxnard equestrienne girls, Perry Henshey and Santa Monica bathing girls.—*Photo courtesy Los Angeles Examiner.*

On the old 20-foot pavement traffic was hemmed in between the beach cottages and clubs on one side and the little used Pacific Electric right of way and tracks along the base of the Palisades. The improved highway is 80 feet wide with two pedestrian tunnels giving safe access to the beach.

The paving and widening of the artery cost approximately $280,000 in which the State, Los Angeles County and the city of Santa Monica shared. The work required three months and 400 men were employed.

The improvement consists of 40 feet of 8-inch thick asphalt concrete pavement laid adjacent to the old 20-foot pavement on the northerly side. From the edge of this asphaltic concrete pavement, 13 feet of 4-inch asphaltic concrete was laid to the gutter line. The gutters are 3 feet wide and a 4-foot sidewalk is provided on the north side.

This project has been under discussion for a great many years, but it was not until the latter part of 1932, when the Pacific Electric Railroad decided to abandon its car service on the Santa Monica Canyon line, that steps were taken to secure the necessary right of way.

At that time it seemed that railroad right of way would revert to the original property owners and be subdivided and sold in small lots. If this had been done the improvement of the highway would have had to be postponed indefinitely on account of the high valuation which would have been placed on these small parcels of land, so close to the beach.

(Continued on page 26)

FROM BOTTLENECK TO BOULEVARD—Improved link of State Highway No. 60 at Santa Monica along the coast below the Palisades, now a fine four-lane highway is pictured at top. The old 20-foot pavement with the widening operation under way is shown in center picture, and below are "before" and "after" views of the California Avenue Incline connection.

Power Essential to State Water Plan

(Continued from page 1)

Francisco by ordering the troops into that city during the recent strike.

It has been suggested that if we will drop the power development feature of the plan the PWA would probably grant funds necessary to carry out the immediate construction of the water conservation project.

But Director Earl Lee Kelly of the Department of Public Works and State Engineer Edward Hyatt, who has worked assiduously for ten years to bring this great plan to fruition, advise me that development and sale of electric power is absolutely essential to the success of the plan as a whole and that the water and power features can not be divorced. And I have the fullest faith and confidence in the wisdom and judgment of these two able executives of the Department of Public Works.

WOULD HALVE REVENUES

Mr. Hyatt states that the elimination of the power feature would reduce the cost of the project by about 20 per cent, but would also reduce the revenues by as much as 50 per cent. A large amount of electric power will be necessary for pumping the water in San Joaquin Valley. If the cost of that power must be added to the other cost of amortization and operation of the plan in the sale of water, it would appear that the cost to the farmer purchaser would be prohibitive.

If President Roosevelt was correctly reported in his address made recently at the site of the $31,000,000 Bonnieville Dam Federal project in Oregon, I feel sure that we can get his support of our State Water Plan in its entirety. The President is reported as saying that "the principle of government needs yardsticks so that people in this country will know whether they are paying the proper price for the electricity of our times. I conceived the idea," he continued, "that the government could create yardsticks. One already has been started on the Colorado River [Boulder Dam]. Two other yardsticks have been undertaken—a Tennessee, and a Columbia project—and the fourth, the St. Lawrence, is going to be started."

The Central Valley Water Plan would be such a yardstick for California and one that is just as much needed and would be just as beneficial as those he mentions for other States in the Union.

I am sure, therefore, that we can rely upon the utmost consideration and cooperation from President Roosevelt in securing the eventual success of our plan, and I will, accordingly, use all the power and influence conferred on me as Governor to achieve for California the realization of the Great Central Valley Water Plan in its entirety with both water and power features included and carried into successful operation.

Furthermore, and of almost equal importance, is the employment that the building of this great project would give to thousands of our people. It is estimated by the engineers of the State Water Department that the construction of this project would provide directly and indirectly employment of 25,000 men for a period of approximately three years.

TWO NEW TOPOGRAPHIC MAPS OF COOPERATIVE SURVEYS AVAILABLE

New topographic maps covering the Los Viejos Hills and Kettleman City quadrangles in Kings County and the Halls Flat Quadrangle in Lassen and Shasta counties are now available.

The Los Viejos Hills Quadrangle was surveyed in 1930 by the U. S. Geological Survey in cooperation with the State of California. It is published on a scale of 1:31,680 with contour intervals of 5 and 25 feet and covers an area lying south and east of Murray.

The Kettleman City Quadrangle was likewise surveyed by the topographic branch of the U. S. Geological Survey in cooperation with the State of California. This is an advance sheet only and will later be published in final form in color. The scale is 1:31,680 and the contour intervals are 5 and 25 feet. It covers an area in and about Kettleman City.

The Halls Flat Quadrangle is a Federal sheet published at present in advance form only. It will later appear in final form in color. The advance sheet is on a scale of 1:96,000. The final sheet will be published on a scale of 1:125,000 with a contour interval of 50 feet. It covers an area south of Fall River Mills and east of Hat Creek.

POST-BANQUET SMILES—In this official group that assembled after the barbecue at Lakeport are, front row left to right: Simeon Chapman, President Lake County Chamber of Commerce; Supervisor Frank Noel; Secretary John Howe; Ex-Mayor Herbert V. Keeling; Highway Commissioners Timothy A. Reardon, Philip A. Stanton, Harry A. Hopkins, chairman, and Dr. W. W. Barham; Director of Public Works Earl Lee Kelly. Rear row: Assemblyman E. C. Crowley; Secretary George Cook; Supervisors E. L. Herrick, W. T. Smith, and J. S. Kelsay; Editor W. J. Bolce; J. M. Paige, Ontario; E. W. Spencer, Pomona; District Engineer J. W. Vickrey; L. V. Campbell, Engineer, City and Cooperative Projects; Supervisor L. L. Burger; A. Dalton, Chairman Redwood Highway Counties Committee.

Highway Commission Meets in Lakeport

AT THE request of the Lake County bureau of information, chamber of commerce, board of supervisors and other civic bodies, the California Highway Commission held a meeting in the city of Lakeport on July 18th.

A caravan of representatives of the nine counties of the Redwood Empire Association escorted the commissioners from Sacramento via Napa, St. Helena, Calistoga, Middletown, Lower Lake and Kelseyville.

On arrival in Lakeport the party was greeted by a reception committee composed of Chairman J. A. Youngreen, Mayor H. G. Crawford and W. W. Prather, who escorted the officials to a beautiful spot on the shore of Clear Lake, where a bountiful barbecue feast was served. Former Mayor Herbert V. Keeling acted as toastmaster and master of ceremonies at the barbecue program, which included musical selections and speeches by Harry A. Hopkins, chairman of the commission, and Commissioners Philip A. Stanton, Timothy A. Reardon and Dr. W. W. Barham. Director Earl Lee Kelly of the Department of Public Works brought a message from Governor Frank F. Merriam, and Chairman A. E. Dalton of the Redwood Empire Association Nine Counties Committee spoke on road matters.

COMMISSIONER REARDON PRAISED

Chairman Hopkins, in behalf of the commission, expressed deep appreciation for the hospitality of the people of Lake County, and explained the reasons for the postponement of the original plan to meet in Lake County on July 6th and 7th.

Director Kelly lauded the good work that Commissioner Reardon has been doing in behalf of Lake County, which lies in the district that he represents on the board. Commissioner Reardon replied that the present Highway Commission had done much to take off the shackles of the people of rural northern California in many sections where for lack of roads they were virtually shut-ins.

Ernest C. Crowley, the blind Assemblyman, who represents Lake, Napa and Solano counties, concluded his remarks by stating that he felt that the Highway Commission would cooperate in every way to help in the up-building of that district.

COMMISSION MEETING HELD

Following the barbecue, a regular meeting of the commission was held in the superior courtroom in the county courthouse and was attended by a large number of people. Chairman Hopkins, in his opening remarks, stated that while the coming of the commission to Lakeport was much in the nature of a courtesy visit, the people could consider the meeting as a regular meeting of the board.

Commissioners Reardon, Stanton and Barham spoke on the highway work of the commission, as did also Director Kelly, who expressed his appreciation of the kindly cooperation of the board and called attention to the fact that the five members are business men who work for the State without pay and give many hours of their valuable time in behalf of highway matters.

After an opportunity had been given any person to bring any road matters before the meeting, Chairman Hopkins again expressed the appreciation of the commission for the hospitality shown them and particularly thanked the ladies' committee for the beautiful floral decorations of the courtroom.

Upon adjournment of the meeting, the commissioners were most graciously entertained by Mr. and Mrs. Herbert V. Keeling at their beautiful home on the lake shore and later were guests of Dr. W. R. Prather of Adams Springs for dinner.

Governor Merriam Leads First Party Through Yerba Buena Pioneer Bore

GOVERNOR FRANK F. MERRIAM, escorted by Chief Engineer C. H. Purcell on July 24th, led a score of leading California citizens, members of the Financial Advisory Committee of the San Francisco-Oakland Bay Bridge project, through the pioneer drift, which has pierced Yerba Buena Island, the bridge stepping stone in the middle of San Francisco Bay with a hole 12 feet square and 540 feet long.

The Governor and visitors were guests of Admiral Thomas J. Senn at a luncheon in the Admiral's quarters, prior to the inspection of the tunnel.

When the visitors arrived, because of the presence of the Chief Executive of the State of California, they were met by a Marine color guard of 30 men. The Governor's arrival was heralded with a fanfare of bugles and a salute of the regulation "nineteen guns." The same salute marked the Governor's departure.

URGES UNEMPLOYMENT RELIEF

At the east portal of the tunnel Joseph R. Knowland of the Financial Advisory Committee introduced Governor Merriam, chairman of the California Toll Bridge Authority, who said:

"I have been a member of the Toll Bridge Authority since the inception of this project, and I have loaned my efforts to the best interests of the transbay bridge, not alone because it will aid the counties of Alameda and San Francisco, but because it will give work to so many men.

"This bridge will bind together in commercial and spiritual unity the cities of both sides of the bay and, although they may retain their political entities, they will be one great city in spirit and in commerce.

"Now is the time for us to plan for employment in the winter. I want to bring this especially to the attention of those in charge of the work on the San Francisco-Oakland Bay Bridge to the end that the work may be pushed forward as much as possible at this time so that a maximum number of men may be given work this winter.

"Please consider with all seriousness the winter employment problem and plan your work now so that as large a number of men as possible may be given work at the time when our people in California will need it most.

PLEASED WITH PROGRESS

"I am pleased with the progress that has been made on the bridge, and I trust it will go on without interruption."

Frank C. MacDonald, State labor leader, declared that the bridge was doing incalculable good in supplying jobs for thousands of men.

Admiral Senn spoke for the Navy, and Chief Engineer Purcell pledged the Department of Public Works engineers to the task of speeding up work so that the maximum number of men may be employed during the winter season.

The small pioneer tunnel that the official party passed through is the first of two parallet pilot bores, each 12 by 12 feet, that has been drilled through. Three more of these small tunnels will be driven through the hill and then the five will be broken into one large tunnel 76 feet wide by 58 feet high, which will be the largest bore tunnel in the world.

After inspecting the work on the island, the Governor was taken to Pier W-3, a half mile east of San Francisco, where the Governor guided to position the first base plate upon which Pier W-3 will be erected.

Those accompanying the Governor on the inspection of the bridge work were Harrison S. Robinson, Joseph R. Knowland, Leland W. Cutler, E. B. De Golia, E. Clarence Holmes, Frank C. McDonald, John P. Symes, Charles O. Conrad, R. H. Glassley and James Quinn of the Financial Advisory Committee. In addition there were present W. N. Burkhardt, C. E. Baen, E. J. Schneider, Albert Huber, E. L. Turkington, Justus F. Craemer, secretary to Governor Merriam, Mrs. Justus Craemer and Mrs. Thomas J. Senn.

Hotel Guest—Table ready for a party, eh? But why have you set the plates and tableware five feet apart?

Proprietor—It's an anglers association dinner and we always like to give each guest room to tell his fish stories.

MORE JOBS FOR WORKERS must be provided this winter Governor Merriam told engineering executives of the San Francisco-Oakland Bay bridge, urging them to plan accordingly, as he was greeted by the men employed in boring the first pilot tunnel through Yerba Buena Island.

TWO PILOT TUNNELS each 12 by 12 feet have been bored through Yerba Buena Island, the first of which was completed on July 24th when Governor Merriam led a party through it. Three more small bores will be driven and all broken into one large 58 by 76 foot tunnel.—*Photo courtesy San Francisco Examiner.*

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ..... Director
JOHN W. HOWE ..... Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 15 AUGUST, 1934 No. 8

Roads and Prosperity

Some one once said, "The prosperity of a nation is measured by its roads."

That is as true today as it was 1000 years ago, and recognition of this fact was given by President Roosevelt in his signing of the Hayden-Cartwright Act, June 18, authorizing $522,000,000 for highway construction.

As civilization progresses the extent and variety of the means of transportation grow. In America today, approximately 25,000,000 motor cars and trucks, several million horse drawn vehicles, and a smaller number of tractors and other highway using machines must find roads on which to travel.

Palliative for Employment

Depression or no depression, the need for more and better roads has never been questioned. Whenever unemployment has become a difficult problem—from time immemorial—public works have been resorted to as a means of providing work for the idle, and this work has usually taken the form of public highways. The famous Roman stone roads were built, in part, to take up the slack in employment and at a time when hard surface roads were considered an unnecessary luxury. Long before the automobile came into being the beautiful winding paved highways of western Europe had been built.

It was no wonder then that when the worst economic dislocation in history descended upon the United States, public works were immediately utilized for the purpose of reducing unemployment and stimulate industrial activity. And highways—highways 16 feet wide to super highways 100 feet in width—were advocated as the most necessary contribution to the Nation's needs.—*The United States News.*

Work Put Under Way During Past Month Totaled $2,729,600

WORK ORDERS issued for construction and maintenance and outstanding advertisements for bids on construction in the total sum of $2,729,600 indicate the progress made by the Division of Highways in getting work under way during the past month up to July 27th.

The following tabulation sets forth the segregation of the amounts accumulated in this total:

CONSTRUCTION		
Contracts Awarded and Pending Award	$1,773,000	
Minor Improvements	62,000	
Day Labor Construction	98,000	
Subtotal		$1,933,000
PROJECTS ADVERTISED		86,300
MAINTENANCE		
General Maintenance	$438,000	
Specific Maintenance	91,900	
Betterments	29,600	
Oiling Program	69,800	
Miscellaneous Maintenance	81,000	
Subtotal		710,300
Total		$2,729,600

The amount of work which the Division of Highways had under way is represented by the 202 going contracts in force with the Department of Public Works as of July 27th.

Of these contracts 159 were for road construction, oiling and maintenance covering 196.4 miles and 43 for the construction of bridges and grade separations at a total estimated cost of $1,865,400.

REPORT ON SOUTH COASTAL BASIN WELLS IN 1933 ISSUED

State Engineer Edward Hyatt announces the release of Bulletin No. 39-B issued by the Division of Water Resources. This is a mimeographed report giving the records of water levels at a large number of wells in the South Coastal Basin for the calendar year 1933 and also precipitation records for the seasonal year 1932–33 in the same area.

Bulletin 39-B is the second supplement to printed Bulletin No. 39 which summarized all records of similar nature prior to the time of its issuance early in 1932. The bulletin contains 144 pages of data, and may be obtained through the Supervisor of Documents, Bureau of State Printing, Sacramento.

Angry Wife: "Now that I have an electric refrigerator, see what you can do about getting a mechanical secretary."—*Natonal Motorist.*

Edward J. Neron is Appointed to the Deputy Directorship of Public Works

EDWARD J. NERON of San Diego, Past Department Commander, Veterans of Foreign Wars, is the new Deputy Director of Public Works, appointed by Governor Merriam upon the recommendation of Director Earl Lee Kelly.

Mr. Neron served throughout the World War as a lieutenant in the United States Navy, resigning at the end of the war to engage in the advertising business in San Francisco.

After a period of three years in business life he was called East by a death in his family and decided to reenter the U. S. Naval service. He spent six more years in that service and upon retiring went to San Diego to take a position in the office of the district attorney of that county, where he handled special investigation work.

FILLED HIGH OFFICE

He has been active in veterans' organizations, including the Veterans of Foreign Wars and the American Legion, for the past ten years. For two years he was commander of the "Commanders' Council" of all veterans organizations in San Diego County, having some fifty-two units, representing some ten thousand veterans and their families.

He later became California and Nevada Commander of the Veterans of Foreign Wars of the U. S. A., representing some forty thousand members in the two States. He resigned from the district attorney's office of San Diego to accept his present office with the Department of Public Works.

Mr. Neron was born and raised in Minnesota, was educated in the public schools and attended St. John's University of Minnesota. Shortly after leaving college, his love for travel and a keen desire to see something of the world before entering business life prompted him to enlist in the United States Navy as an apprentice seaman and he continued in naval service for seven years.

Impecunious Youth (receiving Leap Year proposal)—Honestly, Jean, marriage is out of the question. Why, I couldn't keep a mouse.

Jean (quite determined)—Of course you could, darling. I love them.

EDWARD J. NERON

MOTOR VEHICLE OWNERS PAID $309,110,436 U. S. EXCISE TAXES

During the fiscal year ending June 30, 1934, the Federal government collected approximately one-eighth of its entire tax revenue from the variety of excise taxes on motor transportation, according to figures made public by the National Highway Users Conference, of which Alfred P. Sloan, Jr., president of General Motors, is chairman.

The Conference tabulations are based on returns to the Treasury Department for the complete fiscal year and show that the motor vehicle owners of the country paid $309,110,436 through the excise taxes on gasoline, lubricating oil, passenger cars, trucks, tires and tubes, parts and accessories, and pipe line transportation of oil.

WORK BEGUN ON ALL-AMERICAN CANAL

The first shovelfuls of dirt were turned on the all-American Canal the week of July 23d as a Los Angeles company began preliminary work on its rock excavation contract at Pilot Knob. SERA headquarters in El Centro sent out several engine operators to the job, the first men in a great construction army which will find employment on the canal during the next three and a half years.

State Routes will be Numbered and Marked with Distinctive Bear Signs

By **T. H. DENNIS**, Maintenance Engineer

THE simplification of highway directional service by the use of route numbers has been demonstrated throughout the country by the U. S. numbered highways. Plans have now been developed to coordinate the main State routes in California in a similar way. To this end, routes have been decided upon, numbers have been assigned, the design of the State route sign adopted, and sign surveys are under way to determine the number and location of the signs required. Routes will be signed as fast as available funds will permit.

Considerable study has been given to the selection of routes and to the system of numbering. In a section of the country where roads run mainly east and west and north and south, the matter is simple. In California, however, with the Coast Range, the Tehachapis and the Sierra Nevada Mountains, the topography and, consequently, the main road locations vary. There is sometimes doubt as to whether a certain road should be classed as north and south or the reverse. Under the system adopted, the routes classed as east and west are given even numbers and the north and south routes the odd numbers. State numbers are not given the U. S. numbered routes as there could be no object in such duplication. Some numbers have been omitted to provide for contingencies due to future developments of the highway system.

New California State Route Sign

NUMBER SYSTEM EXPLAINED

In the selection of numbers, preference in assigning the smaller numbers has been given to the more heavily traveled roads in the vicinity of Los Angeles and San Francisco. In the combination of sections of roads under a single route number, consideration has been given to established traffic habits, so far as known, to provide the most direct route between important termini. Numbers have not been given to short sections of roads which are more or less local in character, even though such sections are important traffic arteries.

The whole purpose of road signing is to provide information for the stranger or occasional visitor. Naturally, the local traffic is acquainted with and takes full advantage of the routes it prefers.

The design of the sign as adopted has been given a good deal of thought. A large number of designs were worked out and abandoned. It is essential that a sign for this purpose be of distinctive shape, simple, and easily read. The design finally adopted was worked up by the Division of Architecture.

The signs will be black figures on white background. The material will be porcelain enamel on 18-gauge steel.

It is anticipated that three signs per mile will be required on an average and that approximately 2000 will be placed this year.

There follows a list of the numbered routes as shown on map printed on adjoining page:

1. Jct. U. S. 101 at Las Cruces, via Cambria, Santa Cruz, San Francisco, Pt. Reyes and Westport, to U. S. 101 at Fortuna.

2. Santa Monica via Santa Monica Blvd. to Jct. Route 18 at Lake Arrowhead, via Arroyo Seco and Cajon.

3. Jct. U. S. 101 at Serra to Jct. U. S. 101 at El Rio, via Santa Monica.

4. Jct. U. S. 40 at Pinole to Jct. Route 89 near Markleeville, via Stockton.

(Continued on page 32)

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE SIGN ROUTES
1934

OREGON

NEVADA

PACIFIC OCEAN

MEXICO

SAN FRANCISCO

LOS ANGELES

SAN DIEGO

SEE DETAIL MAP

SCALE IN MILES

LEGEND

- U.S. NUMBERED ROUTES
- STATE SIGN ROUTES
- COUNTY ROADS
- PROPOSED STATE ROUTES
- BEGINNING AND END OF ROUTES

Road Will Traverse Steep Canyon Wall

(Continued from page 2)

a second camp was established near Bidwell about six miles above Oroville. These two organizations have operated continuously, each occupying three different camp .sites Each have operated two one and one-quarter cubic yard power shovels with the necessary supplemental equipment in the way of compressors, trucks, tractors and graders, except that for the last year three shovels have been operated in the lower camp.

Each of these camps is a well organized unit supplied with a well balanced equipment layout for handling hard rock excavation.

Efficiency studies pointed the way for a better balanced equipment layout which is completed and functioning.

BIG ROCK YARDAGE

During the past five months, notwithstanding the fact that excavation was mostly rock, the average production of the two camps was 105,000 cubic yards of excavation. During a period of seventy-three months these two camps have moved a total of about 3,900,000 cubic yards.

During the six-year period eleven contracts have been completed, six of which were for bridges and five for grading.

The four major bridges are the Feather River Bridge, about four miles from Oroville, the West Branch bridge, ten miles farther on, the North Fork Bridge at Pulga and the Spanish Creek Bridge near Keddie. The first two are concrete arch structures. The bridge at Pulga is a deck steel arch and is unique in that it crosses the river directly over the Western Pacific Railroad bridge. The Spanish Creek Bridge is a high structure of the steel viaduct type.

The gross expenditures during this period were $3,250,000 for work done by the convict camps and $1,700,000 for contract work. Approximately $1,000,000 additional will be spent during the current fiscal year, and another million will be required during the next biennium to complete the grading.

COMPLICATED CONSTRUCTION PROBLEM

The problems of location and construction common to all roads are intensified here by the fact that natural difficulties presented by the topography are further complicated by the existence of a transcontinental railroad, a power plant and three high tension transmission lines.

From the beginning an intensive study has been made of the location through the canyon in order that the required high standards of grade and alignment might be secured with maximum economy, and with minimum disturbance to the existing development.

A third complication is imposed by the regulations of the Federal Power Commission, functioning under the Federal Power Reserve Act regarding future possible although highly improbable development of power by private interests.

TUNNEL THROUGH GRIZZLY DOME

Some of the most difficult work is encountered in the six miles extending westerly from Rock Creek. Two and one-half miles of this distance crosses the bare rock areas designated as Grizzly Dome and Arch Rock. Grizzly Dome is a bare, dome-shaped mass of granite rising precipitously from the water's edge to terminate with gradually flattening slopes in the ridge several thousand feet above. It is separated from the Arch Rock area by Grizzly Creek.

At Grizzly Dome it is necessary to construct at an elevation approximately level with the Western Pacific Railroad to comply with the regulations of the Federal Power Commission regarding future power development in the river.

About four hundred fifty feet of the roadway through the steepest part of the dome will be in tunnel. The remainder will be supported on a ledge cut into the solid face of the rock with some retaining wall construction at critical locations where height of cut or cost of construction would otherwise be excessive.

The Arch Rock area is about 1.75 miles in length and gets its name from an arch-like formation in one of the partly broken surface layers of rock. In general, the road across this area will be built close to high water, supported partly on a niche cut into the solid face and partly on a fill of blocky granite extending into the river channel. Aside from a slight effect on the hydraulic grade of the river, this channel encroachment is not

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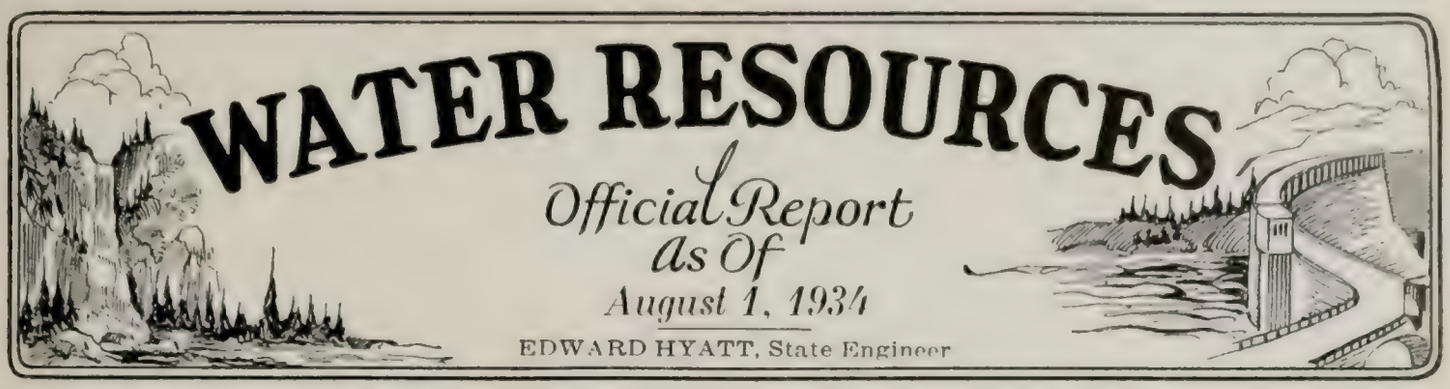

The irrigation districts are making good progress in their plans for refinancing outstanding bond obligations under agreement with the Federal Reconstruction Finance Corporation. One district has already received $1,334,768 from the Federal Government and the District Securities Commission has authorized the voting of bonds, by six other districts, to be issued by the R. F. C. in the total sum of $931,210.

The flow of the Sacramento River at Sacramento had dropped to 1200 second feet on July 15th and a conservation program has been inaugurated to supervise waste prevention measures throughout the Sacramento Valley. Other activities of the Division of Water Resources relative to flood control, applications for reconstruction of dams and salinity measurements, etc., are given in the monthly report of State Engineer Edward Hyatt as follows:

IRRIGATION DISTRICTS

Inspection was made of the work proposed under the $311,000 loan and grant to the Turlock Irrigation District by the Federal Emergency Public Works Administration.

South Fork Irrigation District, Modoc County, at an election held on June 25th voted $165,000 in bonds, which are to be used in support of a Federal loan that has been granted the district for the construction of a storage dam on West Valley Creek, a branch of the South Fork of Pit River.

The La Mesa, Lemon Grove and Spring Valley Irrigation District, San Diego County, has received $1,334,768, the total amount of the refinancing loan granted by the Federal Reconstruction Finance Corporation, and has called in its original bonds from all holders who have deposited under the refunding plans of the district. This is the first California irrigation district to begin liquidating its outstanding bond obligations under a refinancing agreement with the Federal Government. The La Mesa District has also received aid from the Federal Government in the loan and grant of $600,000 for the reconstruction of its main conduit.

DISTRICTS SECURITIES COMMISSION

The Commission issued feasibility orders and authorized the voting of bonds to be issued by the Reconstruction Finance Corporation as security for refinancing loans as follows:

Carmichael Irrigation District	$47,500
Citrus Heights Irrigation District	77,500
Cordua Irrigation District	102,725
Banta Carbona Irrigation District	602,500
Fairoaks Irrigation District	53,800
Hot Spring Valley Irrigation District	47,185
	$931,210

Other orders issued by the Commission were:

Palo Verde Irrigation District—Approval of setup of reserve fund as required by Reconstruction Finance Corporation in the district refinancing plans.

Turlock Irrigation District—Authority to call an election on $240,000 principal amount of bonds to secure a loan and grant of $311,000 from the Federal Emergency Public Works Administration for concrete lining and other construction works.

Modesto Irrigation District—Authority for change of plans and sale of bonds.

Waterford Irrigation District—Approval of readjustment plan.

Santa Clara Valley Water Conservation District—Certificate of certification, under Chapter 906, Statutes of 1933, for district bonds in the principal amount of $2,000,000.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

On July 25th, from 60 to 100 men from the Federal Transient camps located in District 1500 and District 1660 started the clearing and grubbing of timber growth in the Tisdale and Sutter By-passes.

Sacramento Flood Control Project—Bank Protection.

Work on the State Federal cooperative program for permanent bank protection has been continued by the U. S. Engineer Office in Sacramento. Recently a Federal allocation of $100,000 was made available for this work for the fiscal year 1934–35, to which has been added $50,000 from State funds, making a total of $150,000 available for the year. The program for the expenditure of this money is now in preparation in cooperation with this office.

(Continued on page 27)

How Highway Development Aids in Increasing Attendance at State Fair

WIDE, smooth highways will be as great an inducement as any of the many entertainment features in attracting exhibitors and visitors to the eightieth annual California State Fair which opens in Sacramento for ten days beginning Saturday, September 1.

On no other single occasion in the year are the people in every county of the State made so conscious of the benefits of a unified highway system which permits easy travel from every section of California right to the gates of the fair grounds.

Under the administration and control of the Division of Highways of the Department of Public Works and the California Highway Commission, the network of highways which focus in Sacramento has been brought to standards compatible with the development of modern motor vehicles.

While the motor car industry has evolved this means of transportation to its present high state of development, engineering practice in highway construction has expanded standards of alignment, grade and width of highway to provide adequate means for the ever increasing volume of traffic.

EXHIBITS ARE INCREASED

These present day standards of road construction, providing wide, well-built pavements, superelevated curves of long radius and grades held to a low minimum, enable modern cars and trucks to safely travel the great distances from the far corners of the State to Sacramento in a relatively short time.

The advantages—and economies—of holding to these road building standards, will be revealed in a hundred different ways both before and during the California State Fair.

Easy transportation of exhibits is bringing a record increase in entries, especially from small individual ranchers and live stock men who can load their prize peaches or carefully groomed Hampshire hogs into a truck and transport them safely and quickly from their door to the exhibit pavilion at the fair grounds.

For every mile that improved highways have penetrated into some of the remoter rural sections of the State there has been a widening of competition in the hundreds of agricultural and live stock classes which make up the backbone of the fair.

LOW COST TRANSPORTATION

The increase in county displays this year from 26 to 45 has been largely induced by the low costs with which a distant county, using its own truck equipment and building crews, can install its exhibits.

Humboldt and Ventura counties, for instance, were the first two counties to be on the ground to install their displays. With little loss of time in traveling, each brought its men and materials right into the great horticultural building on its own trucks.

Constant freshening of displays with newly-picked fruits and flowers is planned by most of the counties through speedy motor deliveries.

EFFECT ON ATTENDANCE

The most marked effect of highway improvement, however, is in the increase in visitor attendance.

An impressive correlation is shown in the following figures on increase in highway construction for the ten year period 1924–1934 and the increase in fair attendance for the ten year period 1923–1933.

HIGHWAY MILEAGE

Type	Miles 1924	1934
Earth	1,523	4,056
Untreated rock surface	734	390
Bituminous treated rock surface	346	4,350
Pavement	2,019	4,777
Unimproved	1,778	501
Totals	6,400	14,074
Per cent increase		45

STATE FAIR ATTENDANCE

1923	138,499
1933	327,069
Per cent increase	42

Over a comparable decade, State Fair attendance has grown almost as rapidly as the increase in improved highway mileage, and, according to Secretary-Manager Charles W. Paine of the State Fair, largely as a result of this highway improvement.

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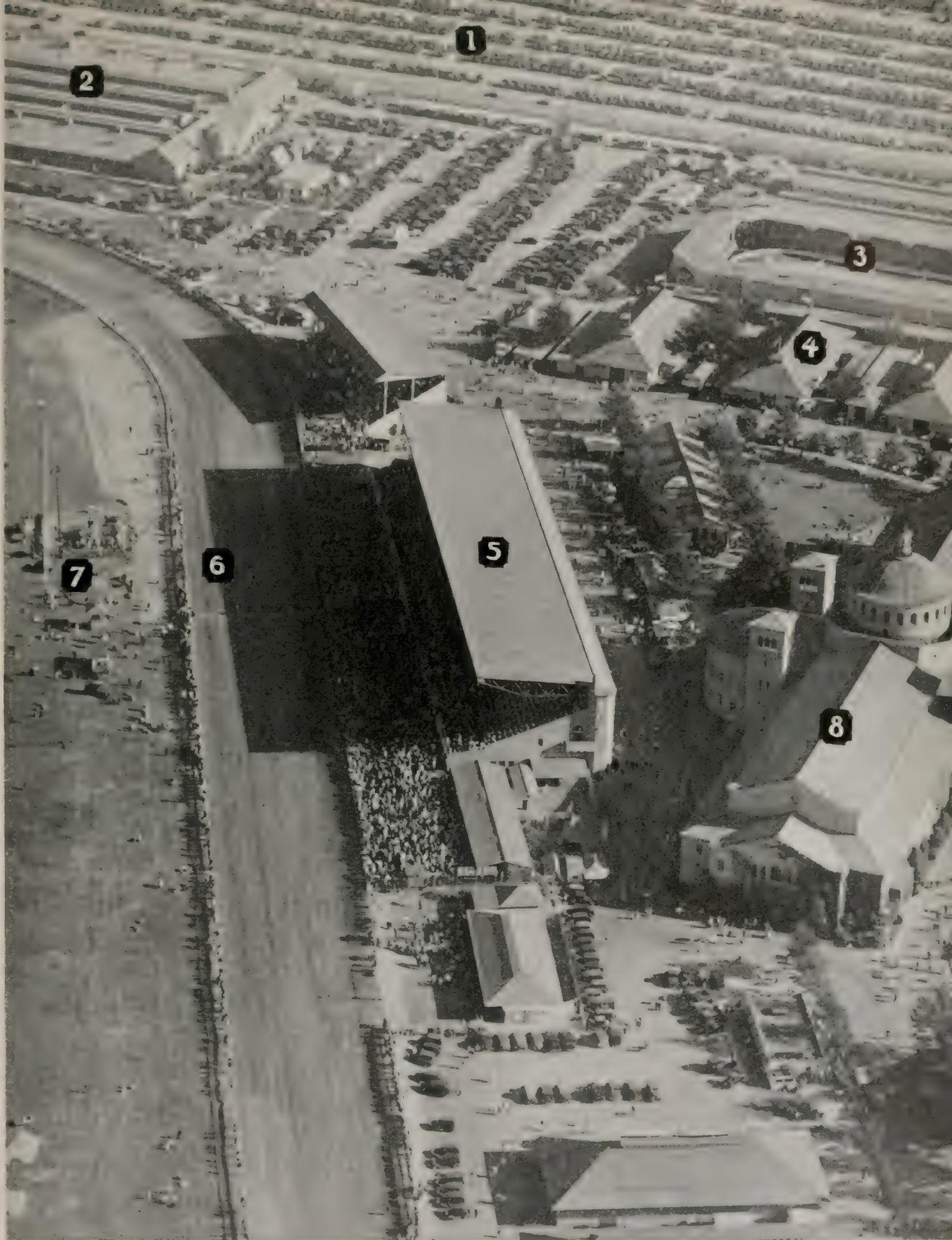

AROUND THE GROUNDS AT THE STATE FAIR—(1) Part of the parking area for 15,000 automobiles. (2) Cattle Pavilion, housing a fortune in blooded stock. (3) Horse Show arena. (4) Show horse barns. (5) Main grandstand, with food and home appliance exposition on ground floor. (6) Mile track, scene of fast running and harness races. (7) Infield, where nightly radio revue and fireworks will be presented. (8) Horticultural Building, housing colorful displays of California counties.

Sausalito Unit and Cloverdale-Hopland Highway Dedicated

(Continued from page 6)

County eliminates the former narrow and twisting stretch from Waldo Point into Sausalito with a four-lane, hard-surfaced standard highway. Interesting figures concerning it are as follows:

Length, 1.55 miles. Average traffic, 500 vehicles daily; considerably more on weekends. Total cost of reconstruction, $249,085, exclusive of rights of way cost, which exceeded $100,000 additional. Old road had 22 sharp curves, equaling 2½ complete circle turns. The new highway, with only six long curves would save 460,000 vehicle miles or 46,000 hours of vehicle time per year, a saving of many dollars annually to motorists.

CLOVERDALE-HOPLAND DATA

The Cloverdale-Hopland sector in Sonoma and Mendocino counties is a major relocation on the east shore of the Russian River, eliminating 227 curves and steep grades of the old road. The new sector is a wide, smooth, safe highway 13.9 miles in length. Interesting details of its construction, financed through State and Federal appropriations, are as follows:

Length, 13.9 miles. Total cost, $1,201,900, in addition to rights of way cost.

The new road is over three miles shorter than the old (18 per cent). It follows the grade of the Russian River, thereby obviating seven summits with a rise and fall of 3500 feet on the old road. Nearly 33 complete circles eliminated.

INCLUDES PARKING AREAS

The new road is wide, high-standard highway, with long tangents connecting up curves of large radius, laid close to the river, and with right of way widened to include many natural beauty spots adjacent to the road and parking areas.

Work on this relocation has been under way since February, 1932. The first contract called for the moving of over 1,400,000 yards of dirt, together with small structures, the total cost exceeding $672,000. Completed and accepted September, 1933.

Five major bridge structure contracts were then let as follows: (1) Bridge spanning the Russian River at Preston; length 337 feet. (2) Overhead railroad crossing at Preston, consisting of one 63-foot steel girder span over tracks and 14 timber trestle approach spans. (3) Bridge spanning Russian River two miles south of Hopland; length 1136 feet, (4) Overhead railroad crossing near Hopland; length 341 feet, consisting of one 32-foot steel girder span on concrete piers and 15 timber approach spans. (5) Bridge across Feliz Creek at Hopland; length 344 feet. Surfacing, bituminous treated surfacing on gravel subbase.

Santa Monica Link Widened as Outlet for Through Traffic

(Continued from page 12)

A friendly condemnation suit was therefore instituted by the State against the Pacific Electric and Southern Pacific railroads to obtain the necessary right of way for widening this important traffic artery.

Surveys were started in 1933 and plans were completed early in 1934. Bids were opened in March, 1934, and the contract for construction was awarded April 4, 1934.

UNDERPASSES REQUESTED

At this stage of the project request was made by the Los Angeles Chamber of Commerce that pedestrian subways be constructed across the highway at Santa Monica Canyon, and also at the lifeguard station at Center Street so that pedestrians could safely cross this heavily traveled highway access to the beach.

Negotiations were entered into with the contractor to include the construction of these two pedestrian subways.

Under this arrangement the contractor completed the paving of this section before July 4th so that the anticipated heavy crowds of that date could be adequately taken care of by the widened highway. These pedestrian underpasses are 7 by 7 feet with adequate stairways and will form a very convenient outlet to the beach for people on the opposite side of the highway.

The general purpose of the present improvement is to connect the already widened pavement, which extends as far east as Channel Road, with Lincoln Boulevard in the city of Santa Monica, making a satisfactory outlet for through traffic along this boulevard, as well as for local traffic coming to and from the beach.

The dedication ceremonies began with a luncheon at which Director Kelly and Mayor William H. Carter of Santa Monica were the chief speakers and Geoffrey H. Morgan was toastmaster.

Following the luncheon, an automobile parade moved to a barrier at the foot of California Avenue, where, after three Santa Monica bathing girls had welcomed three equestrian girls from Ventura County, Director Kelly unlocked a huge padlock to which was attached a garland barrier and declared the highway open to the public.

Water Users Organize to Stop Waste

(Continued from page 23)

Sacramento Flood Control Project.

In connection with the preparation of right-of-way for the construction of the levee on the right bank of the Sacramento River above Colusa, this division has been requested by the Reclamation Board to raise the Packer warehouse, at an estimated cost of $3,000.

Mokelumne River.

It is expected that work will commence within the next ten days on an SERA project for clearing the Mokelumne River By-pass between Reclamation District No. 1002 and the McCormack-Williamson tract, involving 4500 man-hours of labor with a crew of 20 men.

WATER RIGHTS

Supervision of Appropriation of Water.

Forty applications to appropriate water were received during the month of June, 13 were denied and 14 approved. During the same period 3 permits were revoked and rights were confirmed under 25 permits by the issuance of license.

Adjudications.

Eagle Creek (Modoc County)—A stipulation for judgment has been signed by about four-fifths of the water users and is now being circulated amoug the remaining parties.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The flow of the Sacramento River at Sacramento has dropped from 3000 second-feet on June 15th to about 1200 second-feet on July 15th. The corresponding flow on July 15, 1924, was about 870 second-feet and on July 15, 1931, practically zero. The flow of the San Joaquin River near Vernalis was about 400 second-feet on July 15th. On the corresponding date in 1924 it was also 400 second-feet and in 1931 it was 200 second-feet.

These data show that as far as summer stream flow is concerned the present season is somewhat better than in 1924 or 1931, the previous extremely dry years. However, water supply conditions have been such as to require that every effort be made to conserve water and the Permanent Committee of the Sacramento-San Joaquin River Problems Conference has initiated a conservation campaign throughout the Sacramento Valley. All of the larger projects diverting water from the Sacramento River have appointed conservation officers to supervise the waste prevention measures in their respective districts and to cooperate with the Water Supervisor on all water saving measures. In conjunction with this work the Water Supervisor's office is conducting the regular measurement of all divisions, stream flow, return flow, salinity, etc., as in past years.

The table given below indicates that salinity has advanced well up into the Delta, but the comparison shown for corresponding salinity in 1924 and 1931 reflects about the same relation between the present season and these previous years as above indicated for stream flow conditions.

Comparison of Salinity at Bay and Delta Stations on July 14, 1924, 1931 and 1934

Station	*Salinity in parts of Chlorine per 100,000* 1924	1931	1934
Point Davis		1670	1500
Bullshead		1500	1360
Collinsville	796	810	620
Emmaton	464	540	280
Three Mile Slough Bridge		430	230
Rio Vista Bridge	302	315	70
Isleton Bridge	114	146	21
Howard Ferry		98	14
Antioch	614	710	440
Webb Pump	165	245	78
Central Landing	56	60	25
Mandeville Pump		42	17
Middle River Post Office		22	11
Williams Bridge		15	12

STATE FAIR ATTENDANCE INCREASED BY GOOD HIGHWAYS

(Continued from page 24)

This year improved highways are counted upon to put the fair attendance well over the 400,000 mark. Such special events as American Legion Day on September 2, the Wine Festival on September 5, the Farmers Day on September 7 and the three day Native Sons and Native Daughters Admission Day celebration on September 8, 9, and 10 will draw thousands of visitors who will want to make a quick one-day round trip by automobile.

Convenient highway transportation will also be used as a sales argument for the purchase of reduced-price State Fair scrip books by an army of 18,000 Future Farmers and 4-H Club members throughout the State. For the first time in its history the State Fair will have, through these junior agricultural organizations, advance representatives in every county in the State.

Not until the barriers of narrow, rutted roads, sharp curves, and steep grades had been removed has such a plan been possible.

The state-wide web of highways whose units tap even the most outlying sections, will thus draw a traffic flow to the wide arterials and laterals which traverse the State from Oregon to Mexico that will come to rest in but a few hours time in Sacramento.

Rumsey-Clear Lake Highway Opened With Gala Ceremony and Barbecue

MORE than 2500 interested citizens of a dozen California counties gathered at Rumsey, in western Yolo County, on Saturday, August 4, to enjoy a barbecue and witness the formal acceptance by Governor Frank F. Merriam of the Rumsey-Clear Lake State Highway. This new road, while only 15.3 miles in length, opens up the western end of Yolo County for the first time and affords an outlet to Lake County and the north coast region, connecting with the Tahoe-Clear Lake-Ukiah State Highway at the Bear Creek bridge, 18 miles west of Williams. It shortens the distance between the lower Sacramento Valley and the beautiful Clear Lake area by approximately ten miles and its construction cost the State nearly half a million dollars.

Some twenty years ago citizens of Lake, Colusa and Yolo counties dreamed of a shorter connection between the great recreational area around Clear Lake and the San Joaquin and Lower Sacramento valleys. By enactment on May 18, 1915, the California State Legislature added to the State highway system Route 50, to be known as the "Rumsey-Lower Lake Road."

CONSTRUCTION BEGAN IN 1930

However, no funds were provided for the construction of the route and in the development of the State road system it was some years before the building of this short cut along the precipitous walls of Cache Creek and the more rolling hills of the Bear Creek Valley. In July, 1930, the Division of Highways established a camp along the route and construction of the graded road commenced.

This work was continued until August, 1933, and 8.7 miles of the new route were constructed along Bear Creek from a point 1.4 miles south of the Yolo-Colusa County line to a connection with the Ukiah-Tahoe Highway.

On November 6, 1933, the Director of Public Works awarded a contract for construction of a graded roadbed through Cache Creek Canyon between 2.2 miles north of Rumsey and the southerly end of completed construction. At the same time State forces constructed a temporary steel and timber bridge over Cache Creek and a graveled surface to Rumsey. The temporary timber bridge will be used only until funds are available for the construction of a suitable permanent structure.

PROVIDES SCENIC ROUTE

The new highway is a wide artery with no grades to negotiate and offers a beautifully scenic route from Woodland west to the junction of the Tahoe-Clear Lake-Ukiah Highway. For the greater length of the road Cache Creek tumbles over a rocky bed alongside the highway. Three bridges cross the stream, as it wends its way through the colorful canyon.

The celebration which marked the completion of the road was staged jointly by the civic and service organizations of Yolo and Lake counties. Jack Rickabaugh, representing the Western Yolo Chamber of Commerce, was general chairman, and Robert G. Alderman, manager of the Woodland Chamber of Commerce, served as general secretary. H. W. McIntire, secretary of the Lake County Information Bureau, was in charge of the Lake County end of the program, which continued on Sunday, August 5.

LARGE OFFICIAL DELEGATION

Among those who attended the event were J. G. Standley, principal assistant engineer of the Department of Public Works; Timothy A. Reardon, State Highway Commissioner; Justus Craemer, secretary to Governor Merriam; Supervisors Frank W. Noel and E. L. Herrick of Lake County; Supervisors W. O. Russell, W. J. Naismith and Frank B. Edson of Yolo County; Supervisor C. J. Westcott of Colusa County; Congressman Frank H. Buck, State Senators Frank L. Gordon and J. M. Inman, Assemblymen J. H. O'Donnell and E. C. Crowley, C. C. Cottrell of the California State Automobile Association, and many hundreds of others, all of whom particularly enjoyed the delicious barbecued beef and "the trimmings." The Preston School of Industry sent its band of 36 pieces to the celebration.

Following the formal dedication of the highway a large caravan of cars traversed the new road and continued on into Lake County for the week end.

A REAL JUBILEE EVENT for the citizens of Yolo, Colusa and Lake counties occurred on August 4th when Governor Merriam officially opened and dedicated the new Rumsey-Clear Lake Highway affording a short cut through the mountains to the great recreational area of the Clear Lake region and the North Coast country. A portion of the scenic highway near Rumsey is shown above with Governor Merriam being assisted in the ribbon cutting by an octette of lovely girls of Yolo and Lake counties. At the left are three Clear Lake yachting girls led by "Queen" Vera Behrens of Kelseyville. At the right is "Queen" Wanda McGrew of Woodland representing Yolo County accompanied by Miss Davis, Miss Knights Landing and Miss Western Yolo County. After the ceremony a caravan of autos traversed the 15 miles of new road into Lake County.

Highway Bids and Awards

FOR JULY

FRESNO COUNTY—At Coalinga, erect maintenance buildings and appurtenances. District VI. R. Hodgson & Sons, Porterville, $6,690; Thomas C. Irwin, Fresno, $7,755; Theo. Johanns, San Francisco, $5,888. Contract awarded to D. A. Loomis, Glendale, $5,528.

KINGS COUNTY—Two timber bridges 23 and 25 miles south of Fresno. No. 1, 11-19′ spans on pile bents. No. 2, 3-19′ spans on frame bents. District VI, Route 125, Section E. John T. Bibb, Glendale, $12,856; J. W. Terrell and M. A. Jenkins, Sacramento, $12,978; Stroud Bros. & Seabrook, Bakersfield, $13,987; Bundesen & Lauritzen, and Delta Dredging Co., Pittsburg, $14,156; Ralph A. Bell, Los Angeles, $14,585; contract awarded to Robert D. Paterson, Santa Barbara, $12,745.

INYO AND MONO COUNTIES—Between 6.4 miles north of Bishop to California-Nevada State line, 25.7 miles to be treated with fuel oil at various locations. Dist. IX, Route 76, Sections A and B. Tieslau Bros., Inc., Sacramento, $8,696; Gilmore Oil Co., Los Angeles, $7,520; Oilfields Trucking Co., Bakersfield, $7,335. Contract awarded to Paulsen & March, Inc., Los Angeles, $6,747.

LOS ANGELES-ORANGE COUNTIES—23.3 miles of roadbed shoulders to be treated with fuel oil, with a bituminous seal coat. Dist. VII, various routes and sections. Geo. Gardner & Sons, Redlands, $11,877; Gogo and Rados, Los Angeles, $12,245; Kovacevich & Price, Inc., South Gate, $12,440; Dimmitt & Taylor, Los Angeles, $13,509; Kemper Construction Co.., Ltd., Los Angeles, $14,275. Contract awarded to Sunset Decomposed Granite Co., Los Angeles, $9,882.

LOS ANGELES COUNTY—Bridge across San Gabriel River. 5-19½′ R. C. girder spans on concrete piers. 11-19′; 2-15′ timber trestle spans bridge across Coyote Creek. 1-42′ R. C. girder and 2-19′ timber spans. District VII, Route 174, Section B. Geo. Mittrey, Los Angeles, $71,069; Parish Bros., Los Angeles, $71,283; Lindgren & Swinerton, Los Angeles, $82,093; Oscar Oberg, Los Angeles, $76,472; Clinton Construction Co., Los Angeles, $89,952; Wm. T. Loesch & Son, Los Angeles, $85,016; Dimmitt & Taylor, Los Angeles, $87,920; Bannister Field Co., Los Angeles, $81,634; Herbert M. Baruch Corp., Los Angeles, $88,556; Theo. A. Beyer Corp., Los Angeles, $86,038; C. Bongiovanni Construction, Hollywood, $86,666; Person & Thiele Co., Los Angeles, $82,064; Sharp & Fellows Contracting Co., Los Angeles, $76,512; Bodenhamer Construction Co., Oakland, $86,966; Kemper Construction Co., Ltd., Los Angeles, $84,485; David J. Read and Joseph Maiser, Los Angeles, $81,654; M. B. McGowan, Inc., San Francisco, $88,604. Contract awarded to B. O. Larsen, San Diego, $70,961.

LOS ANGELES COUNTY—In Los Angeles County Park, erection and completion of maintenance station buildings. District VII Pacific System Homes, Inc., Los Angeles, $5,500; J. B. McIntosh, Glendale, $5,666; Norman Barber, Los Angeles, $5,886; Willard Lutz, Los Angeles, $5,900; Charles J. Dorfman, Los Angeles, $6,462; A. H. Watson, Los Angeles, $6,599.

MADERA COUNTY—Between 2.9 miles east of Madera and junction of route 125 and the county road to Bates, 16.4 miles oiling. District VI, Routes 126, 125, Sections B, C and B. C. W. Wood, Stockton, $9,150; Tiffany Construction Co., San Jose, $9,960; John Jurkovich, Fresno, $10,200; Stewart & Nuss, Inc., Fresno, $10,950; Tieslau Bros., Inc., Berkeley, $12,000. Contract awarded to Granite Construction, Watsonville, $8,940.

NAPA COUNTY—Furnish and construct crusher run base and bituminous treated surface between Napa and Greenwood Corner about 0.6 miles in length. District IV, Route 8, Section B. Pacific States Construction Co., San Francisco, $15,583; Lee J. Immel, Berkeley, $15,936; Tieslau Bros., Inc., Berkeley, $15,863; Ransome Co., Emeryville, $16,237. Contract awarded to E. A. Forde, San Anselmo, $14,577.

ORANGE COUNTY—Between Talbert Avenue and Heil Avenue near Santa Ana River Bridge, about 1.5 miles to be graded. District VII, Route Buaro Road. Gogo and Rados, Los Angeles, $5,329; Pacific Crane & Rigging, Inc., Los Angeles, $5,904; A. S. Vinnell, Los Angeles, $5,904; Kovacevich & Price, Inc., South Gate, $6,651; John Oberg, Los Angeles, $6,902; Martter & Bock, Ltd., Los Angeles, $7,476; Kuhn Bros., Inc., Manhattan Beach, $7,975; Post Bros., Santa Ana, $8,127; C. O. Sparks, Los Angeles, $8,435; Dimmitt & Taylor, Los Angeles, $8,665. Contract awarded to Sharp & Fellows Contracting Co., Los Angeles, $4,908.

SAN BERNARDINO COUNTY—Between Summit Station and Cedar Springs; between the Stables and North Shore Toll Gate at Lake Arrowhead and between Dolly Varden Angling Club and the South Fork of the Santa Ana River—oiling 28.5 miles. District VIII, Routes 59, 188, 190, Sections C. E, A, E, F. George Gardner & Sons, Redlands, $14,695. Contract awarded to George Herz & Co., San Bernardino, $13,964.

SAN BERNARDINO COUNTY—Cleaning and painting three coats on Mt. Vernon Avenue viaduct. District VIII, Rt. 9, Section S.Bd. G. C. Hewitt Co., Los Angeles, $11,900; Contracting Engineers, Los Angeles, $17,993. Contract awarded to Geo. Hess, Los Angeles, $11,875.

SAN BERNARDINO COUNTY—Between Fourth Street and State Street in Redlands, 1513 lineal feet of reinforced concrete box storm drains to be constructed. District VIII, Route 26, Section Rld. Matich Bros., Elsinore, $37,079.40; C. F. Robbins and S. P. Immel, Ventura, $37,717; Bodenhamer Construction Co., Oakland, $47,658; B. G. Carroll, San Diego, $46,712; Kovacavich & Price, South Gate, Inc., $38,987; Oscar Oberg, Los Angeles, $39,819; George Hess, Los Angeles, $39,272; Franklin B. Gridley, Pasadena, $41,720; Sharp & Fellows Construction Co., Los Angeles, $40,961. Contract awarded to Miracle Co., San Diego, $36,127.34.

SAN FRANCISCO—Potrero Avenue between Division Street and Army Street, 1.4 mile to be widened with P. C. C. and A. C. District IV, Route 68, Section S. F. The Fay Improvement Co., San Francisco, $209,056; Eaton & Smith Co., San Francisco, $177,734; Pacific States Construction Co., San Francisco, $184,540; A. J. Raisch, San Francisco, $187,892; Hanrahan Company, San Francisco, $175,482. Contract awarded to Union Paving Co., San Francisco, $164,115.

SANTA CRUZ COUNTY—Saratoga Gap Maintenance Station Buildings. District IV. A. Soda & Son, Oakland, $7,891. Contract awarded to Theo. Johanns, San Francisco, $6,890.

SISKIYOU COUNTY—Between McCloud and the Junction of Routes 3 and 83. District II, Route 83, Section C. Ransome Company, Emeryville, $8,183; E. F. Hilliard, Sacramento, $9,720; Tieslau Brothers, Inc., Berkeley, $10,459. Contract awarded to Hanrahan Company, San Francisco, $8,119.

TULARE COUNTY—Between Kern County line and Porterville; and between Tulare Wye and 4 miles west of Lindsay, oiling 29 miles of shoulders. District VI, Routes 129, 134, Sections A, B; B. John Jurkovich, Fresno, $12,880; Tiffany Construction Co., San Jose, $14,000; L. A. Brisco, Arroyo Grande, $15,400: Contract awarded to Stewart & Nuss, Fresno, $11,340.

YOLO-SACRAMENTO COUNTIES—M Street Bridge, District III, Route 6, Section C. Healy Tibbitts Construction Co., San Francisco, $912,535; M. B. McGowan and Rocco & Caletti, San Francisco, $919,989; MacDonald & Kahn Co., Ltd., San Francisco, $1,025,224; Raymond Concrete Pile Co. and J. H. Pomroy & Co., Inc., San Francisco, $970,256; J. F. Knapp, Oakland, $949,476; Barrett & Hilp, San Francisco, $984,646; Pacific Bridge Co., San Francisco, $961,688. Contract awarded to George Pollock Co., Sacramento, $907,365.

YUBA COUNTY—Pier protection to D Street Bridge in Marysville across Yuba River. District III, Route 3, Section B. Holdener Construction Co., Sacramento, $12,097; M. A. Jenkins, Sacramento, $12,705; F. H. Neilson, Orland, $12,454. Contract awarded to Bundesen & Louritzan, Pittsburgh, $8,885.15.

Little Girl: "Mother, I'm afraid baby will have seven years bad luck. He just swallowed a piece of mirror."

Odometers Suggested for all Trucks

(Continued from page 9)

The speaker called attention to the fact that some of the states have completed the seven per cent systems and others have extended them. In the extension, care should be used in the selection of the most important general use roads and consideration given to the expenditure of a certain proportion of the funds on the extension of the system into the urban sections.

OPPOSED TO DIVERSION

At the second day's session, Stanley Abel, western vice president of the American Road Builders Association, spoke of the activities of that organization in consolidating the component parts of the entire highway industry into a working unit to support the highway programs. This association furnishes a clearing house on a national scale.

It was particularly active and very effective in presenting to the membership of Congress the ability of the State highway departments to meet the national emergency quickly and effectively in giving jobs to men on worth-while work in the unemployment emergency. The association has also conducted a concerted drive to prevent further diversion of motor license fees and gasoline taxes from highways—the one thing that will surely wreck the whole highway program if the money of motorists continues to be diverted to other than highway projects, highway maintenance and highway debt service.

James B. True, State Highway Engineer of Wyoming, stated that there has been $60,000,000 expended in the State of Wyoming during the past twenty years, of which $40,000,000 has been expended by the State and $20,000,000 by the counties. All of us who have journeyed over the excellent highways in Wyoming can certify to the wisdom of the expenditure of the $40,000,000 of State funds. Although a large state in the mountainous section, with many miles of roads, excellent progress has been made.

E. M. Whitworth, Superintendent of the Motor Vehicle Division of the Arizona State Highway Department, read a very interesting paper on the "Taxation of Motor Vehicle Fuel and Motor Carriers in the State of Arizona." He called attention to the growing use of Diesel engines using a low grade fuel oil in motor vehicles, which presents a very important problem in taxation. Inasmuch as most of the State revenues are predicated upon gasoline tax, a change to a low grade fuel would jeopardize the present method of taxation.

Mr. Whitworth recommended that, pending a solution of the problem, vehicles using Diesel fuels be taxed on a flat tax commensurate with the tax paid by the gasoline-driven vehicles. It is a subject that has been given very little consideration, but one, in my opinion, that should receive the careful study of all highway officials and State legislatures.

TRUCK ODOMETERS SUGGESTED

Mr. Whitworth also spoke of the methods of obtaining motor transportation fees either through ton-mile taxes or gross revenue taxes, both of which have many unsatisfactory phases and necessitate considerable expense in collection. It was Mr. Whitworth's opinion that the ton-mile tax was the most equitable method and he suggested that locked odometers be installed on all trucks and that these be read at regular intervals by those charged with the enforcement of the Motor Transportation Act.

The members of the convention enjoyed the hospitality of the Seattle Chamber of Commerce at a luncheon, at which time an extemporaneous speech was made by Mr. Warden and a prepared paper read by President T. S. O'Connell on "What Federal Aid for Highway Construction Means to the West." He spoke of the giant tourist industry which started in the West some years ago as a little, one-horse concern in Los Angeles, the chief commodities of which were climate and real estate. Inasmuch as these were not shipped to the consumer, the consumer must of necessity go to the source of supply in order to reap the benefit. The tourist crop of the West is a very profitable one and all of the western states have a great deal to sell to the tourist in the way of diversified scenery and climate.

At the business session the following officers were elected for the ensuing year: Preston G. Peterson, president; S. C. Durkee, vice president; R. H. Baldock, secretary and treasurer.

ROAD WILL TRAVERSE STEEP CANYON WALL

(Continued from page 22)

expected to have any effect since the rocks composing the fill will be too massive to be dislodged by the current.

TWO MORE TUNNELS REQUIRED

Two short tunnels will be required in this area through projecting points where open cutting would require removal of large masses, the disposal of which would fill the river channel.

The road is now completed from Oroville to Jarboe Pass, twenty-one miles, and from Keddie to Belden, another twenty-one miles. Of the intervening twenty-nine miles, six miles near Pulga have been graded, and a contract is soon to be awarded for grading 2.5 miles between Rock Creek and Storrie, and other contracts for three bridges across the North Fork between Tobin and Rock Creek. The remainder of the road is being constructed.

Friend: "What did you do when you found out your husband was leading a double life?"

Wife: "Oh, I redoubled."

List of State Route Sign Numbers

(Continued from page 20)

5. Jct. Rte. 13 near Glenwood to Jct. Rte. 1 at San Francisco.

6. Santa Monica to Jct. Rte. 39 near Fullerton.

7. Jct. Rte. 3 at Torrance to California-Nevada State Line north of Coleville, via Mojave; and from Nevada-California State Line near Reno Jct. to California-Oregon State Line at New Pine Creek, via Alturas.

8. Stockton to California-Nevada State Line near Woodfords, via Jackson.

9. Santa Cruz to Milpitas, via Redwood Park.

10. Jct. Rte. 3 south of Venice to Jct. U. S. 101 at Santa Ana, via Manchester Avenue and Santa Ana Boulevard.

11. San Pedro to Jct. Route 118 near La Canada.

12. Jct. Rte. 1 at Jenner to San Andreas, via Santa Rosa, Rio Vista and Lodi.

13. Santa Cruz to Jct. U. S. 101 at San Rafael, via San Jose, Mt. Eden and Oakland.

14. Hermosa Beach to Jct. Rte. 18 near Olive, via Artesia Avenue.

15. Long Beach to Jct. U. S. 99 near Monterey Park, via Atlantic Blvd.

16. Jct. Rte. 20 near Wilbur Springs to Jackson, via Sacramento.

18. Jct. Rte. 19 near Artesia to Victorville, via San Bernardino and Big Bear Lake.

19. Jct. Rte. 3 near Long Beach to Jct. U. S. 66 near Lamanda Park.

20. Jct. U. S. 101, near Ukiah, to Jct. U. S. 40 near Emigrant Gap, via Marysville and Nevada City.

22. Jct. Rte. 3 north of Seal Beach to Jct. U. S. 101, via Ocean Ave.

23. Jct. Rte. 3 near Aliso Canyon to Fillmore.

24. Woodland at Jct. U. S. 99 to Jct. Route 7 near Reno Junction, via Oroville and Quincy.

25. Jct. Rte. 198 near Priest Valley to Jct. U. S. 101 near Gilroy, via Hollister.

26. Jct. Rte. 3 at Seal Beach to Jct. U. S. 101 near Santa Ana.

27. Jct. Rte. 3 near Topango Beach to Jct. Rte. 118 at Chatsworth.

28. Jct. Rte. 1 near Albion to Jct. U. S. 40 near Davis, via Sage Canyon.

29. Vallejo to Upper Lake, via Calistoga and Lakeport.

32. Orland at Jct. U. S. 99 to Jct. Rte. 36 near Deer Creek Meadows, via Chico.

33. Maricopa to Jct. U. S. 50 near Tracy, via Coalinga.

35. Jct. Rte. 22 near Seal Beach to Jct. U. S. 99 near West Covina, via Santa Fe Springs.

36. Jct. U. S. 101 near Scotia to Jct. Rte. 7 east of Susanville, via Red Bluff.

37. Jct. U. S. 101 near Ignacio to Jct. Rte. 28 near Monticello, via Napa.

39. Jct. Rte. 3 near Huntington Beach to Jct. Rte. 2 near Valyermo, via Covina.

41. Cambria to Yosemite Park, via Paso Robles and Fresno.

44. Jct. U. S. 101 near Arcata to Alturas, via Redding.

440. Redding to Lassen National Park, via Viola.

45. Jct. Rte. 24 at Knights Landing to Jct. Rte. 32 Hamilton City, via Colusa.

49. Jct. Rte. 140 at Mariposa to Jct. Rte. 24 near Reno Jct., via Sonora, Jackson and Nevada City.

55. Jct. Rte. 3 at Newport Beach to Jct Rte. 18 near Olive.

65. Jct. U. S. 99 at Famoso to General Grant National Park, via Porterville.

71. Jct. U. S. 80 near San Diego to Jct. U. S. 66 near Claremont, via Elsinore and Temecula.

74. Jct. U. S. 101 at San Juan Capistrano to Jct. Rte. 740 at Perris.

740. Jct. Rte. 111 near Indian Wells to Jct. U. S. 60 near Riverside, via Perris.

78. Jct. U. S. 101 at Oceanside to Jct. U. S. 99 near Kane Springs, via Ramona.

79. Jct. U. S. 80 near Descanso to Temecula, via Aguanga.

89. Jct. Rte. 7 near Coleville to Jct. U. S. 99 near Mt. Shasta, via Truckee, Quincy and Chester.

94. San Diego to Jct. U. S. 80 at White Star, via Jamul and Campo.

95. Jct. U. S. 66 Near Cajon to Jct. Rte. 7 near Little Lake.

96. Jct. U. S. 101 at Klamath to Jct. U. S. 99 near Yreka, via Klamath River.

98. Jct. U. S. 80 at Seeley to Jct. U. S. 80 near Midway Wells, via Calexico.

104. Jct. Rte. 12 near Walnut Grove to Jackson, via Galt.

108. Jct. Rte. 49 at Sonora to Jct. Rte. 7 at Sonora Junction.

111. Jct. U. S. 99 at Brawley to Jct. U. S. 60 at Whitewater, via Mecca, Indio and Palm Springs.

118. Jct. U. S. 101 near El Rio to Jct. U. S. 66 at Pasadena, via San Fernando.

120. Jct. U. S. 99 at Manteca to Jct. Rte. 168 at Benton, via Groveland and through Yosemite National Park.

126. Jct. U. S. 101 near Ventura to Jct. U. S. 99 at Castaic, via Santa Paula.

127. Jct. U. S. 91 at Baker to California-Nevada State Line near Death Valley Junction.

132. Jct. Rte. 33 at Vernalis to Mariposa, via Modesto and Coulterville.

138. Jct. U. S. 99 at Gorman to Jct. U. S. 66 at Cajon, via Lancaster.

140. Merced to Jct. Rte. 120 through Yosemite National Park, via Mariposa.

150. Surf to Jct. Rte 126 at Santa Paula, via Santa Barbara and Ojai.

152. Jct. Rte. 1 at Watsonville to Jct. U. S. 99 at Califa, via Los Banos.

166. Jct. Rte. 1 at Guadalupe to Jct. U. S. 99 south of Bakersfield, via Maricopa.

168. Jct. Rte. 41 near Fresno to California-Nevada State Line, via Huntington Lake and Bishop.

178. Jct. U. S. 101 at Santa Margarita to Jct. Rte. 7 at Freeman Junction, via Bakersfield.

180. Jct. Rte. 25 at Paicines to Jct. Rte. 7 at Independence, via Fresno.

190. Jct. U. S. 99 at Tipton to Death Valley Junction, via Lone Pine.

195. Palo Verde to California-Nevada State Line, via Blythe and Needles.

198. Jct. U. S. 101 at San Lucas to Sequoia National Park, via Coalinga.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

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Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

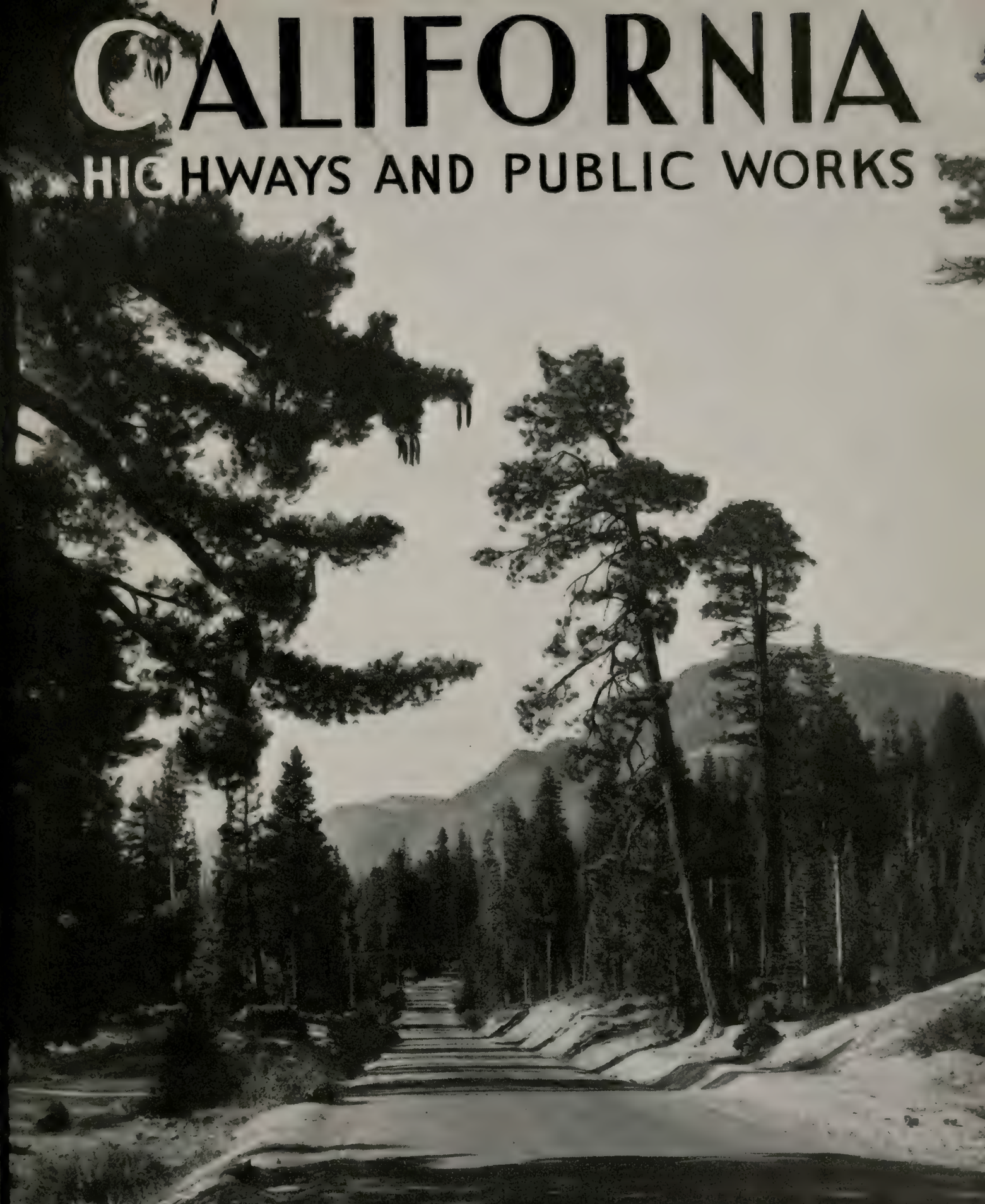
MAP
SHOWING
STATE HIGHWAY SYSTEM

LEGEND
Primary Roads
Secondary Roads

SAN FRANCISCO AND VICINITY

LOS ANGELES AND VICINITY

CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Scene on State Highway Route No. 38
West of Lake Tahoe

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Official Journal of the Department of Public Works

SEPTEMBER 1934

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$1,000,000 Relief Allocation

By Highway Commission Assures

12,000 Californians a Living

Through the Coming Winter

By **EARL LEE KELLY,** Director of Public Works

WHEN the California Highway Commission held its regular meeting in Sacramento, September 7th, some 12,000 Californians faced a winter of privation and want through the exhaustion of the unemployment relief fund set up for the Division of Highways in October, 1933, by which 3200 heads of families had been provided part-time work on road maintenance crews throughout the State.

The laying off of these family men meant that their numerous dependents would be thrown back upon the charity lists of the various counties and communities thus putting an additional burden upon the already overburdened local relief agencies.

When Governor Merriam's attention was called to this serious situation he declared some way must be found to keep these family heads at work through the winter. He personally urged the members of the California Highway Commission to give the matter their most earnest attention and work out a solution whereby funds could be made legally available for continuing the part-time employment.

EARL LEE KELLY

As a result, the commission at its meeting pooled the savings on contracts which had been accumulating during the entire biennium and voted $1,000,000 for continuing the relief program until about March 1, 1935. The heads of more than 3200 California families will thus be continued in their half-time jobs on the highways and the spectre of a winter without work and steady pay roll income is banished for them.

In its vote appropriating the $1,000,000, the commission provided for the distribution of the work throughout the State. To insure the work being well distributed over the highway system, a division of the funds was incorporated in the vote requiring that $325,000 be expended for work on primary roads and $675,000 on secondary roads.

Under the present relief program, which has been in force since last October and which is to be continued by the funds just provided by the commission, about 3200 men have been given employment. The men work in alternate weeks, eight hours a day for five days; by this method the Division of Highways maintenance crews have been enlarged by approximately 1600 men. The wages paid are $4.40 per day.

(Continued on page 16)

Slides on American Canyon Cutoff Make Excavation Total 1,306,000 Yards

By **R. E. PIERCE,** District Engineer

GRADING on the so-called American Canyon cutoff, in progress since October, 1933, is now nearing completion. This project on California Route 7 and U. S. Route 40 extends from the Carquinez toll bridge to Cordelia, where it connects with State Route 8.

This project is a relocation of the important section between San Francisco and Sacramento, of the transcontinental route to the east via Donner Pass through the Sierra Nevada. It will effect a saving of six miles in distance and eliminate all grade crossings with the railroad. There are five such grade crossings on the present route, which runs via Jameson Canyon to the Napa Wye and thence through Vallejo. The only contact with a railroad on this new cut-off is at Cordelia, where a subway has already been completed.

SLIDES IN BIG CUT

This grading contract, 10.3 miles in length, is especially noteworthy for the size of some of the cuts and fills. One cut, 130 feet deep and 2400 feet long, had an estimated volume of 520,500 cubic yards, nearly half the estimated total of 1,166,000 cubic yards of excavation on the job.

Adjacent to this cut, on the north, is a fill 75 feet high and 2500 feet long having an estimated volume of 605,600 cubic yards. This yardage comes partly from the "big cut" above described, and partly from another large cut adjacent on the north with an estimated excavation volume of 217,300 cubic yards.

Due to unforeseen soil conditions, the amount of material to be moved has exceeded the original estimates, and it has been necessary largely to abandon our plans for terracing cuts and fills, as set forth in a previous article published in CALIFORNIA HIGHWAYS AND PUBLIC WORKS.

TERRACING ABANDONED

Our plans for terracing this work were based on our observation of the newly completed highway work on either side of the cutoff, which in rather large cuts already opened up indicated a fairly stable condition. However, as work progressed it became evident that the conditions on this job were radically different.

The top soil and decomposed rock were underlain by a blue clay, lying in planes at abrupt angles, and as soon as support of the top soil was removed in several of the cuts, it began to move in toward the roadway. Generally, very little water was encountered, the top material sliding over the clay whether wet or dry.

Test borings indicated considerable water in the slide above one cut, and hoping to avoid moving all the material here, the power shovel was directed to cut a trench at right angles to the roadway, with the expectation of draining this water and stopping the movement; however, the clay planes formed a sort of basin and as the shovel advanced the material moved in toward the shovel so rapidly and became so broken up that it absorbed all the water and none escaped.

STOPPED SLIDE MOVEMENT

We did, however, stop the movement of the slide into the roadway section, and were probably saved the expense of moving considerable material.

In the "big cut" the material continued to break back on both sides, especially on the east, in spite of our early attempts to relieve the load above the sliding plane by working it off on a slope of about 2 on 1 with bulldozer and large scrapers. We believe we have now stopped the trouble by working power shovels along the top of what appears to be a fairly stable formation, making a broad terrace and removing the material above the plane back far enough to prevent further movement into the roadway section.

These slides have caused an excess of material over our original estimate, and in order to dispose of it to advantage, some slight changes have been made in grade and alignment.

140,000 YARDS EXCESS

To the south of the "big cut" the material has been used to raise the grade over a flat

(Continued on page 13)

THE "BIG FILL" of the cut-off is rapidly growing to its designed proportions of 75 feet height and 2500 feet length with a width to accommodate a 40-foot pavement. Excess material from the Big Cut slides is being used to raise and widen the fill to its estimated volume of 605,600 cubic yards. In the center of the fill a timber and concrete bridge is being built.

THE "BIG CUT" of the American Canyon cut-off project is the scene of busy operations to prevent further slides of top soil underlain by blue clay that lies in planes at abrupt angles. Power shovels and trucks are at work making broad terraces and removing material above the sliding planes back far enough to prevent further movement into the roadway.

Building Seawalls of Steel on Ventura Coast Effects a Saving of $117,000

By **R. C. MYERS,** Assistant Engineer, District VII

CONSTRUCTION of nearly three-fourths of a mile of seawall is one of the principal features of a contract which is now in progress for improving 8.47 miles of the Coast Highway immediately northwest of Ventura from Ventura to Mussel Shoal. This portion lies between the cities of Ventura and Santa Barbara and carries a considerable volume of local traffic in addition to the heavy through traffic of the Coast Highway.

The location of this route between Ventura and the Santa Barbara County line was originally confined to extremely narrow limits on account of the topography of the territory, and any widening or other improving of this section has been correspondingly difficult.

Back a very short distance from the shore line a range of very rugged bluffs rises sharply. These bluffs are so steep and rough that the cost of construction of a highway along their slopes would be almost prohibitive. The Coast Line of the Southern Pacific Railroad, which was built years before the State highway was constructed, follows a location back from the beach and as near the base of the steep mountains as practicable. The only location left for the highway was the narrow strip of land between the railroad and the ocean.

FORCED TO THE BEACH

In 1912 and 1913 the 15-foot concrete pavement was constructed, following the railroad right of way as closely as possible. Later, when increasing traffic made it necessary to widen the pavement and roadbed, this work had to be done on the ocean side on account of the proximity of the railroad on the land side. At a few places where the ocean encroached too closely to the highway embankment to permit such widening without some kind of protective work, reinforced concrete seawalls were constructed against which to rest the widened highway embankment. This work was completed in 1927 and the seawalls constructed at that time have successfully resisted erosion by the ocean.

Traffic requirements have since made it necessary to again widen the pavement and roadbed of this important route, and with this further increase in width there are even greater lengths of roadway embankment which would be exposed to wave action unless shore protection work were placed.

Although the reinforced concrete seawalls formerly built answered their purpose very well, their construction was extremely expensive.

A total of 3802 lineal feet of seawall is required on the present contract to permit widening the roadbed to 80 feet to provide room for a 30-foot pavement with wide oiled shoulders and future widening of the pavement which will eventually be necessary.

STEEL WALLS ADOPTED

This length of massive concrete seawall construction similar to the ones previously built would have cost more than $200,000 at the prices previously paid for this work, in addition to the cost of widening the roadbed, pavement, lengthening drainage structures aond incidental work.

Several plans were proposed, but the one which was the greatest promise of economy and success was to construct these walls of interlocking steel sheet piling. The total cost of constructing the walls of this material is estimated to be $83,000, or a saving of $117,000 over the concrete wall.

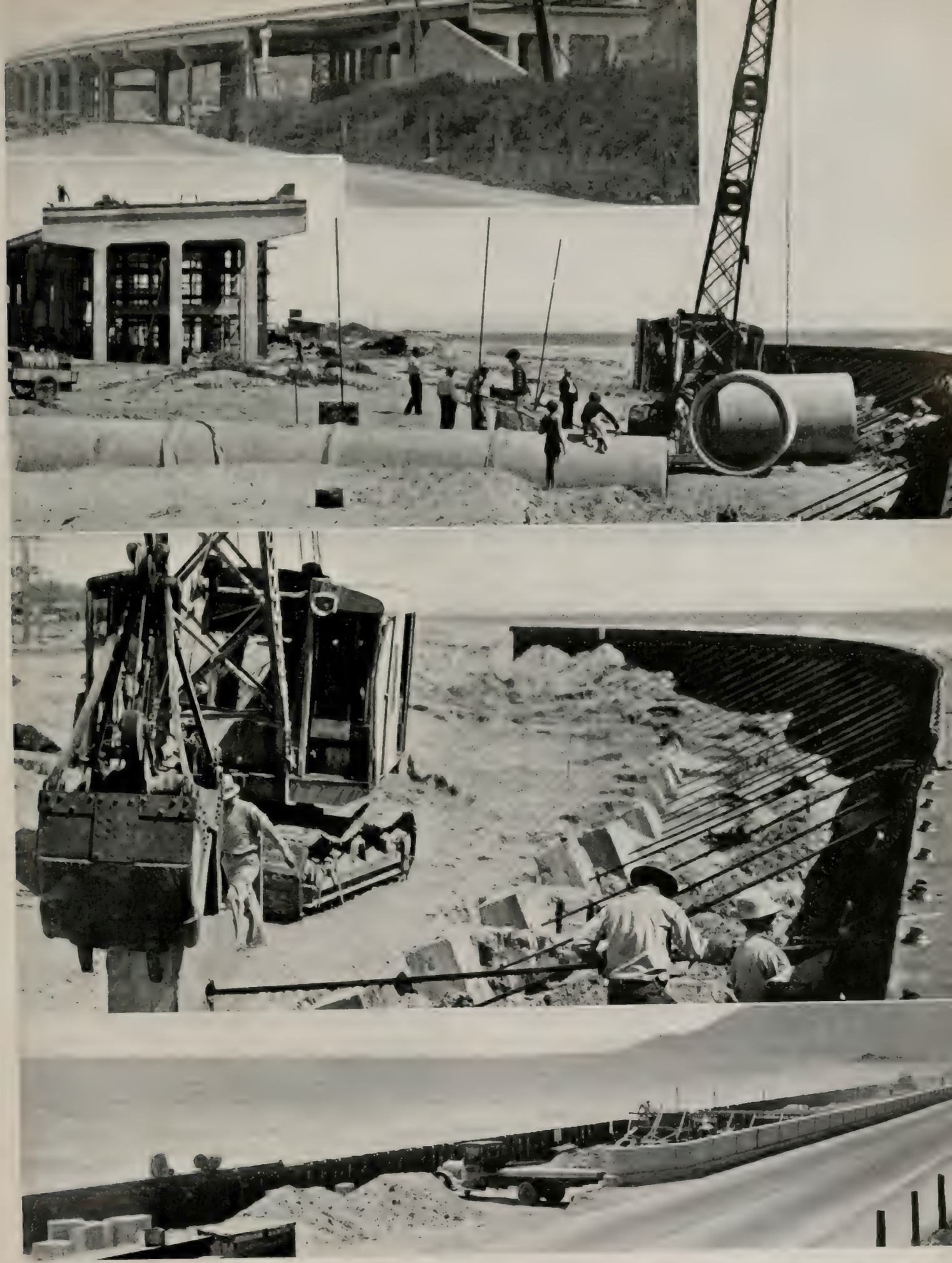
This method was adopted and included in the contract for widening the roadbed and pavement. Three walls are being constructed at exposed locations, being 642, 2500 and 660 feet in length, respectively.

The construction consists of interlocking steel sheet piling driven down through the beach sand and into solid clay or shale beneath. Each sixth pile or "anchor pile" is driven 3 feet deeper than the intermediate piles.

CONCRETE DEADMEN USED

The tops of piles are driven to elevation 10.0 feet, the line of the tops being held securely by creosoted Douglas fir timber wales and caps. Steel throwback plates $\frac{3}{8}$" in thickness are bent to fit the piles and wales and bolted on the ocean side. The whole assembly at the top of piling, including wales,

(Continued on page 20)



STEEL WALLS DEFY OCEAN'S power on the Coast Highway North of Ventura where a change of alignment, elimination of a dangerous underpass and widening operations compel the use of more ocean front right of way. The upper photos show the new overhead structure crossing the existing highway and swinging out on the beach with a portion of the protective steel sea wall already built. The central picture is a close-up of the interlocking sheet steel piling driven to elevation 10.0 feet held in line by the rods extending to concrete dead men. Below, general view of the 3,802 lineal feet of new seawall.

Pavement Records and Construction Progress Made During the Year 1933

By **EARL WITHYCOMBE,** Assistant Construction Engineer

DURING the year 1933, a special effort was made not only to improve the finished product of high type pavements, but to build into these pavements such lasting qualities as assure maximum service by the ever increasing volume of traffic in California. Structural excellence of pavements is desirable, but equally so are smooth riding surfaces, and it is essential that every possible precaution be taken to prevent the roughening of pavements with increased age.

This article deals not only with accomplishments affecting the pavement surface, but also touches on what has been done with those invisible features such as the subgrade and underlying foundation.

TREATMENT OF SUBGRADES

During the year 1928, the joint interval in Portland cement concrete pavement was reduced to 20 feet. This reduction in interval was made in an attempt to control transverse cracking and, as results have proven, was effective in this respect.

During the following winter season, however, it was discovered that considerable objectionable roughness developed in these shorter panels on heavy soils. An investigation of the most affected sections disclosed that the lineal shrinkage of the underlying subgrade material was in excess of 5 per cent.

In 1929, the practice was adopted of selecting material of less than 5 per cent lineal shrinkage with which to construct the upper layers of the roadway. When such selection could not be done during the progress of grading, the grade line was constructed low enough to blanket later to the desired depth with suitable imported material. The thickness of blanketing material was varied according to the results of the soil analysis.

EXPERIMENT WITH FILLER

During the same year, experimental sections were constructed with sponge rubber filler for expansion joints in an attempt to seal against the infiltration of water. These treatments were effective temporarily on the lesser adverse soils.

During 1931, a section of concrete pavement was laid between Maxwell and Williams over rice field adobe which had previously been blanketed with two feet of cementing gravel. The following winter, curling of the slabs on this project became such as to result in a harmonic throw to vehicles at certain speeds.

An investigation was instigated by the construction department and carried out under the direction of the testing and research laboratory. This investigation disclosed that the joint difficulty was the direct result of infiltration of water through the transverse joints, both weakened plane and expansion, causing an uplift of the subgrade at each joint and resulting in curling of the pavement. The pavement was cored at certain intervals in various locations, and samples of the adobe under the gravel blanket disclosed that the moisture content decreased as the distance from the joint increased. Likewise, distortion of the slab varied directly with the moisture content of the adobe.

STUDY REVEALS PHENOMENON

An intensive study of these soils was then made in the laboratory and it was found that when consolidated to maximum compaction with the normal moisture content the specimen, when submerged in water and subjected to a load comparable with the weight of the blanketing material plus that of the pavement, exerted a tremendous force in expanding and swelled to an astounding extent.

To confirm this phenomenon, water was introduced over a period of time through the core drill holes in one of the slabs with the result that the center of the panel was raised to the level of the ends of panel. This led to the discovery that the amount of water absorbed and the resulting swell in any soil when submerged in a consolidated state was inversely proportional to the superimposed load. It then became evident that any adverse soil might be made inactive by blanketing with nonswelling material to a predetermined depth.

This method in many cases, however, is economically impractical, and the present practice is to use one of the following three procedures.

TWO PAVERS laying Portland cement concrete on Ridge Route alternate.

THREE PROCEDURES ADOPTED

(1) Seal off the adverse soil by means of an impervious membrane of ½ to ¾ gallon per square yard of E grade asphalt. Blanketing of such membranes is necessary to a depth sufficient to prevent perforating with stakes supporting the side forms and chairs supporting the pavement steel and dowels.

(2) Saturate the adverse soil sufficiently in advance of paving to obtain the normal expansion before it is covered.

(3) Under-consolidate the upper layers of the grade to reduce the swell when subsequently saturated.

A bearing value test has been developed to determine the supporting value of soils when saturated from a consolidated state. The results of this test determine if blanketing is necessary under either of the two latter cases.

Membranes applied to the immediate subgrade have been experimented with, but are recommended only for protection against alkaline soil conditions. Such membranes soon become an integral part of the pavement slab and, with seasonal slab movement, crack at transverse joints.

FORMER METHODS UNRELIABLE

The laboratory is now engaged with the problem of predetermining the depth of a blanketing material necessary to insure an adequate reduction in load over subgrade material of known bearing value in a saturated condition. These studies have proven the unreliability of our former methods of evaulating the qualities of soils and have resulted in the adoption of newer and more workable yardsticks with which to make our selections.

For the valuable work which has been done with soils and blanketing material we wish to give due recognition to O. J. Porter, who is in charge of the soils and aggregates department of the testing and research laboratory.

Special Investigation of Portland Cement Concrete Pavement Distortion

An investigation by independent agencies was instigated by the construction department to determine the cause or causes for increased roughness which had been noted in several sections of Portland cement concrete pavement and to determine means of preventing its occurrence on future projects. In the early part of 1933, the investigation was carried on cooperatively by the State, the U. S. Bureau of Public Roads and the Portland Cement Association, under the direction of A. A. Anderson, research engineer for this association.

The findings in this investigation indicated that roughness was sufficient in some cases to cause objectionable riding qualities, but rarely exceeded an average of ¼ inch from a 20-foot cord. It was apparent from this study that no one cause could be assigned for the distortion found on all projects. The most outstanding observation was the definite relationship of warping to the type and character of subgrade soil.

CAUSE DEFINITELY ESTABLISHED

It was definitely established that the warping of the pavement on heavy clay soils was due to heaving or expansion of the over-compacted soil at the transverse joints where surface water entered. This caused uplift or curl of the ends of slab and was undoubtedly the chief factor in those cases where the warping produced objectionable riding qualities.

These studies also disclose that pavement slab distortion or curling has developed which was apparently caused by internal forces. Such distortion is generally small, amounting to an average of ⅛ inch or less for a 20-foot slab. The use of concrete mixes with a

(Continued on page 24)

Grapevine Grade Relocation Abolishes Curves Totaling Seven Complete Circles

By **R. M. GILLIS,** District Engineer

WITH the opening on September 11th of a 20-foot strip of concrete pavement and shoulders on new alignment the Division of Highways has abolished the Grapevine grade and its series of dangerous hair-pin curves that have stood as a barrier to traffic between the San Joaquin Valley and Los Angeles.

This improvement is part of the relocation project for 5.2 miles of the Ridge Route at its north end between Fort Tejon and Grapevine Station.

Five miles more of the old 20-foot pavement will still remain to be rebuilt between the Los Angeles County line and Fort Tejon but it contains no "Dead Man's Curve."

Work has been under way on the Grapevine grade since May of 1933. Under the contract now nearly completed the State has, at a cost of approximately $350,000 graded three and a half miles from Oak Glen to one mile north of Grapevine station to a width of 46 feet and paved it with a 20-foot width of concrete. A new contract adds another 10-foot strip of concrete to this to make the full 30-foot width adopted as standard over the Ridge.

COMPLETED BEFORE WINTER

Under the terms of the new contract this three and a half miles must be completed within sixty days after the approval of the contract so that this section will be completed within several weeks. The remaining mile and a half which in itself constitutes a heavy grading contract and includes 30-foot pavement will require two hundred fifty days for its completion.

Practically all of this five mile improvement is in the canyon of Grapevine Creek and is on a sustained 6 per cent grade. One of the complications that has entered into the construction through this narrow canyon is the fact that it is also occupied by the main gas lines from the Kettleman Hills into Los Angeles (a 12", a 22" and a 26" pipe line), in addition to the pipe lines and pumping plants of two major oil companies, and the electrical transmission lines of two other companies.

SKETCH MAP showing Grapevine Grade realignment. Heavy black line indicates new highway.

All of these utilities were on private rights of way and had to be moved to new locations where there was a conflict with the alignment of the new road. This work could only be done at times when there would be the least interruption to the service. The total cost of moving these lines will amount to over $150,000.

MANY CURVES ELIMINATED

The extent of the improvement that will result from the work now under contract is shown by the following comparison of the present and the new lines between Fort Tejon and Grapevine Station where the old road is one continuous series of curves in a distance of 6.04 miles.

A SINUOUS COURSE with many sharp turns is followed by the existing Grapevine Grade sector of old State highway between Fort Tejon and Grapevine Station on the Los Angeles-Bakersfield arterial. The new alignment soon to be opened is shown at the extreme left center passing a huge slope cut of the high hill and joining the present straightaway to Bakersfield a mile to the north.

	Old road	New road
Maximum grade	6.3%	6%
Total curvature in degrees	3396	459
Minimum radius of curvature	80 feet	1000 feet
Length in miles	6.04	5.22

The opening of the twenty-seven miles "Ridge Route Alternate" in October, 1933, between Castaic and Gorman with 30-foot pavement and long curves emphasized the necessity for the early completion of the Grapevine section. The increase in traffic that immediately resulted from the former improvement is well shown by the traffic counts before and after opening:

	16 hour count Sunday	16 hour count Monday
July 1933	2857	2316
July 1934	4177	2976

The fact that the April, 1934, count was still higher is an indication that the July traffic was affected by the waterfront strike conditions existing at that time.

IMPERIAL VALLEY APPRECIATES IMPROVED SECONDARY ROADS

The State Highway Department is not getting its full credit for the splendid work done in Imperial Valley since the last session of the Legislature. Promises of a great road building campaign in the State, with the inclusion of several of our county roads in the secondary system, turned out to be more than mere political gestures. They have become realities.

Distance to Holtville has been shortened 12 miles on the newly oiled Weist and Alamorio road connection. I skimmed down to Holtville from here at 45 miles an hour this week with nary a chuck hole or dust cloud. Twenty-two miles have just been oiled and six miles is the old Sandia-Holtville pavement. The highway by way of Brawley and El Centro is 40 miles long and is no faster.—J. W. McK. in *Calipatria Herald.*

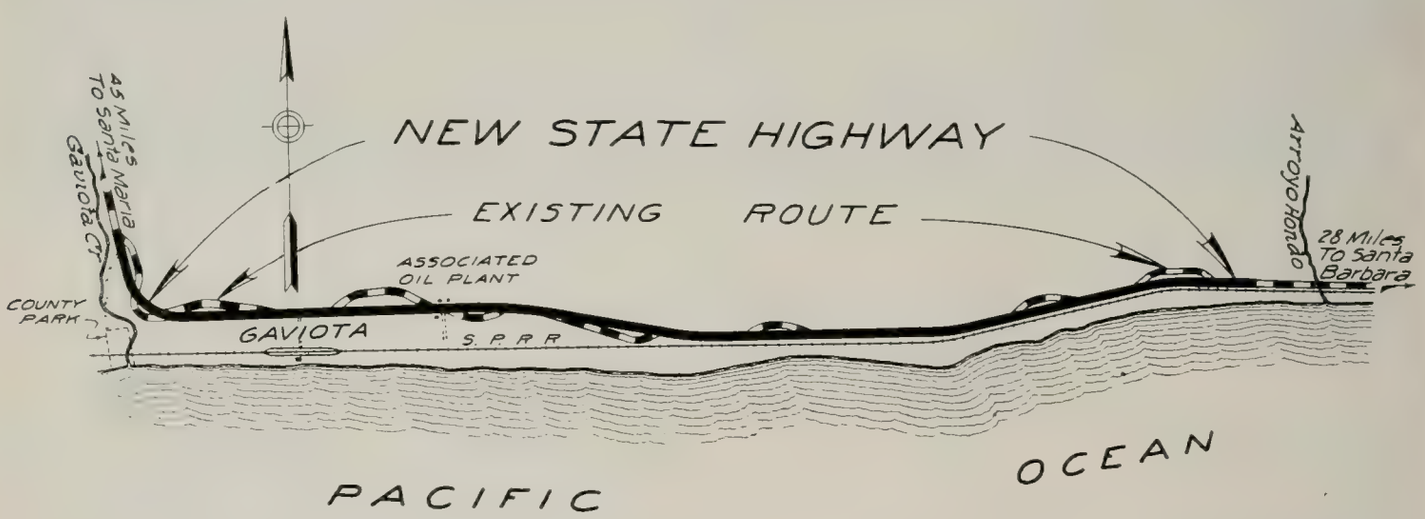
Boulder Dam will contain more material upon its completion than the largest pyramid in Egypt, says a report. Excavators digging for the rock bottom of the river discovered a gorge 85 feet deep and 80 feet wide believed to be 25,000 years old.

Curves and Dips Eliminated on Coast Highway Link North of Santa Barbara

By **LESTER V. GIBSON,** District Engineer

ANOTHER link in the progressive series of reconstruction of the Coast Highway in District V has recently been completed. Early this month, that portion of the highway in Santa Barbara County between Arroyo Hondo and Gaviota was opened to public travel, affording the motorist nearly five miles of modern highway construction in place of the former antiquated inadequate road.

This stretch of highway lies immediately south of the Gaviota Pass relocation project, which was completed about two and one-half years ago. It borders the Pacific Ocean about 30 miles north of Santa Barbara. At this point the Coast Highway swings inland from the ocean and winds its way through the historic Gaviota Gorge, up over the pass of the same name and thence northerly towards Santa Maria.



CURVES AND RAVINES

The line and grade on the old road was far below present day standards and contained innumerable curves, many of radii of 500 feet or less and combined with 7 per cent grades. Several of these adverse combinations were at the bottom of deep ravines and an additional hazard was involved by insufficient superelevation. The original road was built to the old 21-24-foot standard with 15-foot Portland cement concrete pavement 4 inches thick. This pavement was later widened, using 2 foot by 7 inch Portland cement concrete shoulder strips set about $2\frac{1}{2}$ inches higher than the pavement and the space between blanketed with $2\frac{1}{2}$ inches of asphalt concrete surfacing.

The new road is of high speed line and grade, completely eliminating the dangerous conditions so prevalent in its predecessor. The roadbed width is 36 feet and the surfacing is the standard 20′ x 9″-7″-7″-9″ Portland cement concrete type reinforced with heavy wire mesh.

The table below gives a comparison of important features between the old road and the new:

	Old	New
Total number of curves	41	10
Number of curves of 1000′ radius or less	35	1
Minimum radius	300′	1000′
Length of 6 per cent grade or over	3750′	1450′
Length of 7 per cent grade or over	3000′	None
Maximum grade	7%	6%
Total delta	1037°	192°
Minimum vertical sight distance	290′	750′
Saving in distance	0.127 miles	

This project, for about one-half of its length, parallels the Southern Pacific railroad, and a feature of the construction which will be well appreciated by the motorist is the adoption of the grade line at an elevation above that of the railroad, which affords an uninterrupted view across the Santa Barbara Channel towards the distant Santa Barbara Islands. To assure this scenic feature all prisms of earth between the highway and the

(Continued on page 13)

MODERNINZING THE COAST HIGHWAY between Arroyo Hondo and Gaviota in Santa Barbara County, the work of widening the roadway, realigning and removing dangerous dips and curves is about completed. No. 1 is a recently opened section of new highway. No. 2 view of big fill at north end of project looking toward Gaviota with rolling operations in progress. No. 3, fill under construction between railroad and old highway seen at left. No. 4, pouring concrete. Note two tamping machines at work, one for the base course on which to place wire mesh reinforcing and one for the surface course.

July Traffic Count Shows General Increase Over 1933 in Daily Travel

By **T. H. DENNIS,** Maintenance Engineer

THE semiannual count of traffic using the State highways was taken by the Division of Highways maintenance organization July 1st and 2d, between the hours of 6 a.m. and 10 p.m. each day. The field sheets segregate traffic by hourly periods under the following vehicle classifications: California automobiles, foreign automobiles, light trucks, heavy trucks, trailers, buses and horse-drawn vehicles.

In addition to the detail taken at the regular locations on the State highways, the stations on county roads and city streets were included as for the January and March counts in connection with the state-wide traffic survey. The detail, therefore, covered some 2400 points and required 13,800 men. The greater part of this force was furnished from the SERA and CCC crews.

The analysis of the detail in connection with all three counts is now nearing completion and is to be assembled in a single report. Information given at this time, therefore, only covers comparison of counts at stations on the State highway system showing increase or decrease in total traffic for the two-day period as compared to a similar period in 1933.

The per cent gain or loss for the 1934 count as compared to 1933 is as follows:

	Sunday	Monday
All routes	—0.8%	+4.8%
Main north and south routes	—2.3%	+4.0%
Interstate connections	+8.0%	+10.9%
Laterals between inland and coast	+0.1%	+5.0%
Recreational routes	+0.9%	+0.2%

From the above, it appears that the average daily traffic throughout the week has increased generally over that of a year ago.

Gain or loss in traffic volume for State Highway Routes 1 to 80, inclusive, expressed as a percentage of the July, 1933, count is as given below. No comparison can be given for highway Routes 81 to 202 as these latter roads did not become a part of the State highway system until August, 1933, and counts are not available. Of the 76 routes or portions of routes listed, 49 show a gain in traffic for Sunday and 60 show a gain for Monday as compared to the July, 1933, count.

State Highway Route	Termini	1934 Per cent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito to Oregon Line	----	12.0	2.3	----
2.	San Francisco to Mexico Line	----	10.6	---	6.9
3.	Sacramento to Oregon Line	3.1	---	12.4	----
4.	Sacramento to Los Angeles	14.9	---	15.5	----
5.	Stockton to Santa Cruz	----	3.5	1.0	----
6.	Sacramento to Woodland Junction	----	9.2	---	3.8
7.	Benicia-Tehama Junction	4.0	---	5.4	----
8.	Ignacio-Cordelia	----	13.4	2.9	----
9.	San Fernando-San Bernardino	15.2	---	5.7	----
10.	San Lucas-Sequoia National Park	1.8	---	---	3.0
11.	Sacramento-Nevada Line via Echo Summit	11.7	---	13.5	----
12.	San Diego-El Centro	1.0	---	4.5	----
13.	Salida-Route 23 via Sonora Pass	6.8	---	7.1	----
14.	Albany-Martinez	----	5.1	7.4	----
15.	Route 1 near Calpella to Route 37 near Cisco	0.2	---	16.3	----
16.	Hopland-Lakeport	23.6	---	16.4	----
17.	Roseville-Nevada City	10.3	---	21.5	----
18.	Merced-Yosemite National Park	----	20.7	---	20.3
19.	Route 9 West of Claremont-Beaumont via Riverside	1.7	---	8.1	----
20.	Route 1 near Arcata-Lassen National Park	3.9	---	67.1	----
21.	Route 3 near Richvale-Route 29 via Buck's Ranch and Quincy	17.1	---	24.3	----
22.	San Juan Bautista-Route 32 via Hollister	----	3.8	---	6.2
23.	Saugus-Alpine Junction	18.4	---	10.9	----
24.	Lodi-Route 23 via Ebbetts Pass	4.6	---	10.5	----
25.	Nevada City-Downieville (Portion)	22.7	---	37.6	----
26.	Los Angeles to Mexico via San Bernardino	2.5	---	5.5	----
27.	El Centro-Yuma, Arizona	6.2	---	---	1.1
28.	Redding-Nevada Line	18.2	---	21.6	----
29.	Red Bluff-Nevada Line (Portion)	3.8	---	2.9	----
31.	San Bernardino-Nevada Line near Jean	29.7	---	26.4	----
32.	Gilroy-Route 4 near Califa	----	2.5	---	2.7
33.	Paso Robles-Famosa	26.9	---	5.5	----
34.	Twin Cities-Route 23, via Carson Pass	10.9	---	12.8	----
35.	Peanut to Kuntz (Portion)	14.2	---	155.4	----
37.	Auburn to junction Rte. 38, Truckee	12.0	---	5.9	----
38.	Meyers-Nevada Line via Truckee River	----	9.2	2.3	----
39.	Tahoe City-Nevada Line	----	8.1	---	4.6
40.	Route 13-Route 23 via Tioga Pass (Portion)	20.4	---	62.4	----
41.	General Grant National Park	----	8.1	---	14.2
42.	Route 55 to Calif. Redwood Park	10.2	---	19.2	----
43.	Newport Beach-Big Bear Lake via San Bd.	1.3	---	6.0	----
44.	Boulder Creek-Calif. Redwood Park	----	17.9	---	17.0
45.	Willows-Route 3 near Biggs	30.1	---	40.6	----
46.	Klamath River Road	7.1	---	9.3	----
47.	Orland to Chico	21.7	---	27.1	----
48.	McDonald's-Navarro River Road	20.1	---	7.0	----
49.	Calistoga-Route 15 near Lower Lake	----	7.2	24.8	----
51.	Santa Rosa-Schellville	----	5.7	3.7	----
52.	Alto-Tiburon	----	0.6	---	8.9
53.	Fairfield-Lodi	----	11.5	---	2.1
54.	Michigan Bar-Central House	34.5	---	26.9	----

(Continued on page 13)

American Canyon Excavation Total 1,306,000 Yards

(Continued from page 2)

overflow section, and to the north it has been used to raise the "big fill" and widen it to its ultimate width—that necessary to accommodate a 40-foot pavement. This widening has been done by dumping with trucks over the sides of the fill, and then bringing it up in layers with bulldozers, watering and rolling.

The original estimate of excavation yardage has been exceeded by about 140,000 cubic yards to date, and may run somewhat over this when the final quantities are worked up.

As the soil is largely clay and adobe with a high shrinkage, the grade is being built from 1½ to 2 feet low, so that under the next contract it may be brought to grade with selected material of a low shrinkage upon which a pavement may safely be placed.

GRADING COMPLETE IN FALL

In the "big fill' a timber and concrete bridge is being built to provide a farm underpass and care for drainage. This is delaying the work somewhat, as this structure must be completed before all the material from the big cut can be placed.

This contract should be completed this fall, at which time the section will be ready for surfacing. The resident engineer on the job is A. N. Lund.

The Cordelia underpass and approach grading was handled by the Bridge Department. R. H. Twaddle was the resident engineer.

A salesman taking his bride South on their honeymoon visited a hotel where he boasted of the fine honey.

"Sambo," he asked the colored waiter, "where's my honey?"

"Ah don't know, boss," replied Sambo, eyeing the lady cautiously. "She don't wuk here no mo!"

Pupil: "Do you think it's right to punish folks for things they haven't done?"

Teacher: "Why, of course not, Willie."

"Well, I didn't do my home work."

—*Philadelphia Public Ledger.*

Sidney D. Waldon, president of the Detroit Rapid Transit Commission, stated recently: "Planning ahead of a growing city's needs is like putting money in a bank which not only guarantees principal but pays 100 per cent compound interest annually."

Coast Highway Link Improved by Removal of Curves and Dips

(Continued from page 10)

railroad cuts have been daylighted, or removed on a bench section not exceeding 2½ feet above the pavement.

The native soils in this region consist largely of adobe and broken shales, both having high lineal shrinkages, and which are unsuitable material on which to place concrete pavement. This condition necessitated the use of a protective blanket under the pavement of a suitable imported material. This subbase was spread to a depth of 9 inches or more under the pavement and 4 inches on the shoulder. In addition, below the subbase, the native material was sealed with a bituminous membrane of heavy asphaltic road oil.

When formally opened, this road will be a welcome link to the constant series of improvements on El Camino Real and will prove a time saver and eliminate dangerous conditions through this section.

The project aggregates a total construction cost of about $65,000 per mile and is financed and governed by the National Industrial Recovery Act.

JULY TRAFFIC COUNT SHOWS GENERAL INCREASE OVER 1933

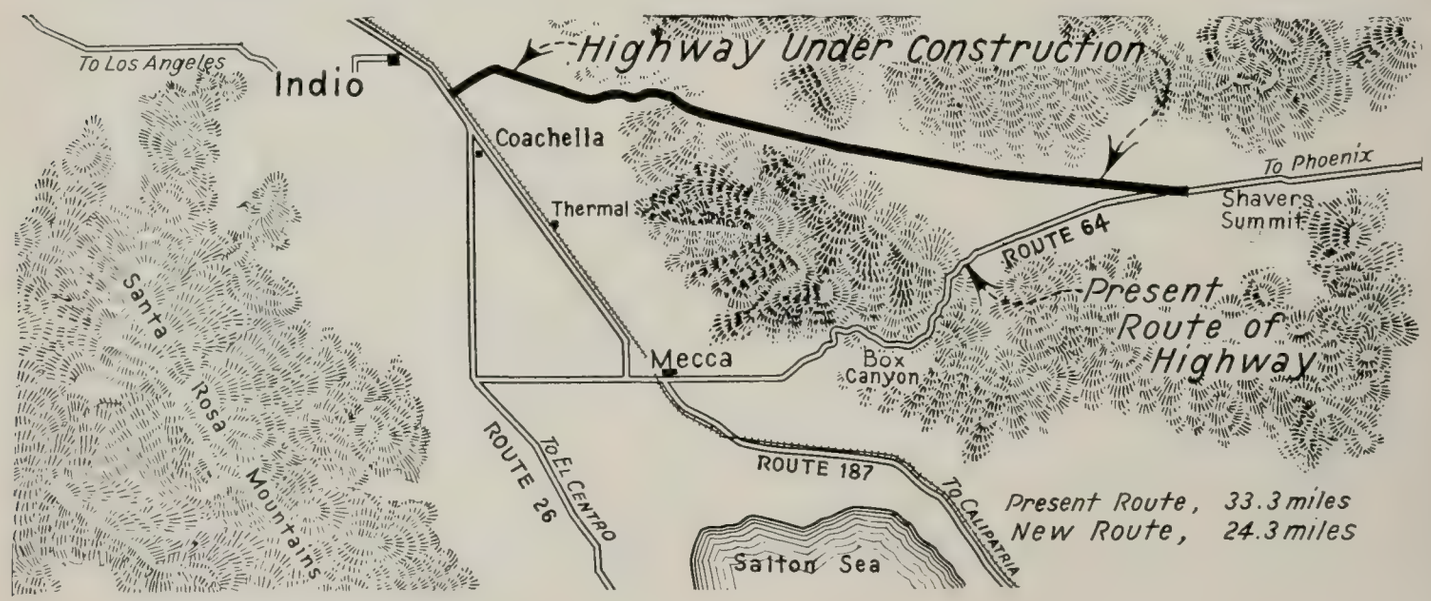
(Continued from page 12)

State Highway Route	Termini	1934 Per cent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
55.	San Francisco-Route 5 Glenwood	----	8.9	---	18.3
56.	Carmel-San Luis Obispo	----	21.3	3.8	----
57.	Rte. 2, near Santa Maria-Rte. 23 near Freeman	19.6	---	21.2	----
58.	Bakersfield-Arizona line, near Topock	86.6	---	99.3	----
59.	Rte. 4 near Baileys to Route 31 near Cajon Pass	3.9	---	---	10.5
60.	Route 2 near El Rio-Route 2 near Serra	1.6	---	---	4.0
61.	La Canada-Route 62 at Pine Flats	7.7	---	80.0	----
63.	Big Pine-Nevada Line	20.6	---	20.4	----
64.	Mecca-Arizona Line	24.3	---	17.8	----
65.	Auburn-Sonora (Portion)	1.1	---	0.7	----
66.	Mossdale-Manteca (Portion)	10.4	---	3.6	----
67.	Route 2-Pajaro River (Portion)	----	17.1	---	18.2
68.	San Francisco-San Jose via Bayshore	----	3.1	4.9	----
69.	San Rafael-San Quentin (Portion)	----	44.3	3.0	----
70.	Ukiah-State Hospital Talmadge	12.8	---	---	15.1
71.	Crescent City-Oregon Line	26.6	---	24.2	----
72.	Weed-Oregon Line	24.4	---	80.6	----
73.	Alturas-Oregon Line	----	20.1	9.4	----
74.	Napa Wye-Carquinez Bridge	----	4.6	5.1	----
75.	Oakland-Walnut Creek (Portion)	2.7	---	1.9	----
76.	Bishop-Nevada Line	22.5	---	6.6	----
77.	Pomona-San Diego	----	2.2	4.7	----
78.	Riverside-Temecula (Portion)	----	5.0	0.9	----
79.	Ventura-Castaic	7.4	---	9.2	----
80.	Zaca-Santa Barbara	----	5.9	17.2	----

Construction Begun on Indio Cutoff Eliminating Dangers of Box Canyon

CONSTRUCTION has started on the final uncompleted link of the highway between Indio and Blythe, known locally as the Indio cutoff. The Indio cutoff is part of the transcontinental highway U. S. Sixty, which extends from the eastern coast in Virginia to Los Angeles in California. The completion of the present project will mean still another step toward the realization of a high-speed, shorter and more direct route to the east from Los Angeles through the hazard of the great Colorado Desert.

The romance of transportation development through this section can best be contrasted by looking back a few short years to that period when flat-bottomed steamboats plied the Colorado River. History tells us that it once took five months to reach the town of Erhenberg across the river from Blythe, traveling by boat from Los Angeles. One perhaps wonders at the amazement of those one-time passengers of the river boat *Esmeralda* had they been told that Los Angeles would be reached by highway in five or six hours.



FORTUNES MADE IN WOOD

In view of the present unemployment problem, it might be well to mention here the labor situation and the manner in which it was solved in the days of the wood burning sternwheelers on the Colorado. The foundations for some present-day private fortunes were started by the ancestors furnishing cordwood for these river steamers. They hired the Indians to gather the wood from along the river and then gave them half of the wood for gathering it.

The cutoff between Indio and Shaver's Summit is of great importance to the people who travel this region. That vast project of the Metropolitan Water District, whose construction parallels this highway, together with the increase in local and transcontinental travel, has put a heavy traffic load upon this desert highway.

The present traffic, as carried by this route, is far in excess of that estimated for 1940, the estimate being based on the traffic count of 1930. The number of cars using the road has increased nearly ten times in the period 1930–1934.

ELIMINATES BOX CANYON

The present project accomplishes a shortening in distance of nine miles, with a resultant saving of construction and operation costs. However, it would be impossible to state the saving in the peace of mind to the tourist and other traveler in the elimination of the necessity of traveling the old Box Canyon road.

The Box Canyon road has been used since the first development of highway facilities in

PIONEERING OPERATIONS are well advanced on the Indio Cut-off from Shaver's Wells on the Mecca-Blythe highway to State Highway 26 just south of Indio in Riverside County. The new road is being cut through desert hills as shown in the above picture. Preliminary construction for one of the bridges over a wash is seen in the background.

OVERLOOKING COACHELLA VALLEY, the route rises from its westerly end near Indio at an elevation of 47 feet below sea level to a maximum elevation of 1688 feet at the summit.

this section. For the most part, it traversed a region subject to cloudbursts and sandstorms. The roadbed followed the many windings of the dry wash in the bottom of the canyon, and a new road or track had to be made after each major storm.

The physical characteristics of the canyon and its immediately surrounding terrain precluded the location of a highly improved highway, although several engineering studies were made as to its feasibility.

The oiling of the old canyon road last fall and its continual upkeep by State maintenance forces will make it serve very well the smaller amount of traffic it will carry after the completion of the present Indio cutoff project.

The highway now being constructed leaves the Indio-El Centro Highway a short distance below Indio, then proceeds in a nearly straight line to its connection with the present improved section near Shaver's Summit. The project is 24.3 miles in length. Its alignment contains 18 curves with a minimum radius of 1600 feet. The route rises from its westerly end near Indio at an elevation of 47 feet below sea level to a maximum elevation of 1688 feet at the summit. The maxi-

(Continued on page 17)

80 Cents of Every $1 Goes to Worker

(Continued from page 1)

Only men with families or dependents, who live in the locality, are employed on the work. The Department of Public Works contacts local officials or relief agencies and selects men adaptable to the work from lists furnished by them. The men live at home and board themselves and the State furnishes transportation to and from the work.

The method of supplying unemployment relief by the expansion of highway maintenance crews has proven to be most satisfactory, as through it a maximum of the money expended goes directly to the men employed. Recapitulation of expenditures on this work during the past year shows that out of every dollar spent on the work eighty cents is paid out in wages to the relief crews and twenty cents goes for supervision, tools, materials, supplies and transportation. The flexibility of maintenance crews is a feature which makes their expansion readily lend itself to providing work for a maximum of man power.

MAXIMUM HAND LABOR

Another important feature of this method of supplying relief is that it provides improvements of undoubted value to the highways, which add materially to the capital investment of Californian motorists in their State road system.

The type of work performed by the men employed on expanded maintenance crews is selected on the requirement of a maximum amount of hand labor and a minimum amount of material. Improvements which are made to the road system by the work of these relief crews cover a wide variety of operations.

The improvements which are most noticeable to the motoring public are the widening and smoothing of roadbed shoulders, the improvement of sight distance by the cutting back of bank slopes at curves and the widening of the roadbed on curves.

IMPORTANT DRAINAGE WORK

But probably the most important work performed by the men is the improvement of drainage conditions. This work consists of clearing roadsides and gutters, cleaning and extending culverts, installing subdrains, constructing rock gutters and planting slopes with shrubs or creeping vines to protect them from serious erosion.

COMPLAINS THAT HIGHWAY IS HOGGING HIS HOG PASS

Carmel, Cal.
July 7, 1934.

State Highway Department,
Sacramento Cal.

Dear Sir:

"Bill" Nye once said, "Hogs, arguments about hogs, and the doings of hogs have filled more premature graves than all other farm animals combined."

Approximately twenty-two miles south of Hollister in San Benito County on the Pinnacles road, I have maintained a hog pass beneath the highway for years. A few days ago your road crew took it into their intellect to place a pipe in this pass so obstructing it that even the most progressive member of the Peccary family found it impossible to squeeze by.

This pass served a dual purpose, that of hog-pass and road-drain. I am asking your department to put this pass in a passable condition for hogs, and if you know anything about hogs you will agree I am not asking a heck of a lot.

Thanking you,

(Signed) JAS. B. McGREERY

Other improvements include the removal of material to eliminate possible slides, filling of low spots or sinks along the roadway, cultivating and trimming roadside trees and many other forms of work which add to the appearance of the highway, increase the safety of travel and prolong the life of construction investments which have been made.

With the funds which were appropriated by the commission for this unemployment relief, it is estimated that the Department of Public Works will be able to continue this work until late in February, 1935.

It is, indeed, a matter of deep gratification to the personnel of the department that the State is able to furnish these 3200 fellow Californians with the means of holding their families together during the coming months and to assist in conserving the morale of these citizens during the present period of readjustment.

Owner of a badly worn racing car: "You'd be surprised at the speed of this car. How much do you think I get out of it?"

Sarcastic Friend: "About every other block."

Indio Cut-off Link of U. S. 60 to Require 15 Timber Bridges

(Continued from page 15)

mum grade attained is a short distance of 6.3 per cent.

While the new cutoff is subject to the same cloudbursts and wind storms as the old Box Canyon route, its drainage problems can be solved practically and economically by timber bridges and their associated means.

There are being constructed under the present project 15 timber bridges, a total of 1767 lineal feet, at a cost of approximately $149,000. These, together with other crossings by means of dips and the necessary ditch and dike controls, will adequately care for the storm problems in so far as it is economically possible to do so.

AIDS UNEMPLOYMENT RELIEF

This contract is financed through the National Recovery Act. As an aid toward unemployment relief, the contract will furnish employment for an average of 100 men during the period of construction. These men will practically all be furnished locally through the Riverside County Reemployment Agency.

The total construction cost on this project is estimated at $456,000 with the chief items of work being the grading and timber bridges. The surfacing is to be the local material treated with 60-70 grade fuel oil by the road-mix method.

The contract was awarded March 30, 1934, and while the date of completion has been set for November 7, 1935, it is expected that the work will be completed by the first part of July of next year. The extreme heat of the summer in the desert makes working conditions far from ideal for this project, but in spite of obstacles, the work is being pushed to an early completion.

In the meantime traffic is using the old Box Canyon route via Mecca. This road is a State highway and will be maintained by State forces.

A hotel was on fire and the guests, gathering out in front were watching the flames.

"Nothing to get excited about," one traveling man was boasting. "I took my time about dressing. Lighted a cigarette. Didn't like the knot in my necktie and retied it. That's how cool I was."

"Fine," remarked a bystander, "But why didn't you put your pants on?"—*Capper's Weekly.*

TRAFFIC SURVEY ELICITS AN EXCHANGE OF COMPLIMENTS

July 7, 1934

Mr. Frank Y. McLaughlin,
Director General,
Emergency Relief Administration,
Los Angeles, California.

Dear Sir:

Your splendid cooperation during the statewide traffic survey made June 30th, July 1st and July 2d, is responsible for the success of that project. This office wishes to extend to you its appreciation of the fine way your organization worked with the State Division of Highways.

The men selected at your various district placement offices and sent out to our numerous traffic stations were, with but very few exceptions, intelligent and well qualified for the work. Mr. W. M. Halpin, whom I believe is in charge of the district placement offices, cooperated with us in every way.

In connection with making up time cards and pay rolls for the SERA workers, the instructions and help we received through Mr. J. B. Miles' office made it possible for us to do that part of the work correctly and to your satsfaction. Both Mr. L. W. Vale and Mr. H. B. Upham, from your office, worked with us and gave us the benefit of their experience, and we were certainly glad to have them help us out.

Thanking you again for your splendid cooperation, I am

Yours very truly,
S. V. CORTELYOU,
District Engineer.

July 9, 1934

Mr. S. V. Cortelyou, District Engineer,
Division of Highways, District VII,
Los Angeles, California.

Dear Sir:

Replying to your letter of July 7th, it is indeed gratifying to receive letters like the one addressed to Mr. McLaughlin, and to receive the opinions of men who thoroughly understand the difficulties which we are encountering in the launching of this relief program. We especially appreciate your recognition of the efforts of the individuals mentioned in the letter for we know that whatever credit is given to this office is gained only through the efforts of the individuals who we believe are so earnestly devoting their efforts toward a successful program.

I might also take this opportunity of congratulating you on the splendid and efficient manner in which this work was directed. We have heard nothing but praise as to the completeness of the survey. I hope that our organization may be of further assistance to you and that you will feel free to submit projects such as the traffic survey for our approval.

With kindest personal regards, I am

Very truly yours,
RALPH B. SMITH,
Executive Assistant,
Emergency Relief Administration.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ---------- Director
JOHN W. HOWE ---------- Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 12 SEPTEMBER, 1934 No. 9

"Best Drink in the World"

Everyone who has traveled the All-Year Highway to Yosemite has noticed the attractive drinking fountain erected by the maintenance crew of the State Highway Department a short distance above Briceburg. Many have paused for a cooling drink; in fact, observers have estimated that over a hundred cars a day stop at this oasis.

Last winter the local maintenance men diverted a spring which was flowing to waste and erected the present rubble stone fountain more or less as an experiment. In our opinion it is an eminently successful one. There are at least three more springs, one on the Briceburg grade and two between Sweetwater Creek and El Portal, that are not in use and could readily be piped, with small expense, for the convenience of travelers.

The Merced River Canyon in the summer is far from cool, and it is to be hoped that the highway department will see fit to erect more of these attractive fountains, that the parched traveler may refresh himself with the finest drink in the world—Mariposa County water.—*Mariposa Miner.*

OILING PINNACLES ROUTE

On the Pinnacles Route from Hollister south, from two miles south of the San Benito River crossing to 3.5 miles north of the San Benito River crossing, and from one mile south of Paicines to Tres Pinos, a distance of about 12 miles, an oil treatment is being applied to the existing roadbed.

"What month is it in which it is unlucky to be married?"

"Goodness me! What a poor memory you have. We were married in March."—*Tit Bits.*

Federal Funds Built 22,000 Miles of Roads and Streets in Year

RECORD speed in putting highway work under way is reported by the Bureau of Public Roads, U. S. Department of Agriculture. On June 23, 1934, just one year after apportionment of the $400,000,000 highway appropriation provided by the National Industrial Recovery Act, an average of nearly $1,000,000 a calendar day had been put to work by the State highway departments in the construction of public works highways.

The improvement of more than 22,000 miles of public roads and streets—a mileage sufficient to build a road almost around the world—will be the result of the expenditure.

The record of the road building reported by the bureau showed on June 23, 1934, the following disposition of the $394,000,000 apportioned:

Status	Number of projects	Public works funds	Miles of highways
Projects completed	2,161	$66,040,000	6,360
Projects under construction	4,963	266,190,000	14,062
Projects awarded but not under construction	580	18,258,000	1,006
Total contracts awarded	7,704	$350,488,000	21,428
Projects approved but not under contract	394	15,440,000	871
Total obligated	8,098	$365,928,000	22,299
Amount apportioned	----	$394,000,000	------
Percentage of apportioned funds obligated to projects			92.9

On Federal-aid highways outside of cities, 95.4 per cent of the available money has been allotted for improvement of 11,922 miles of highways, of which 4061 miles have been completed.

433 MILES IN CITIES

On extensions into municipalities, 89.3 per cent of the funds has been obligated on 1813 miles of wide city streets, of which 433 miles have been completed.

In the secondary road program, involving improvement of rural roads not on the Federal-aid highway system, 92.3 per cent of the funds has been obligated on 8564 miles with 1866 miles completed.

Employment under the program totaled 246,192 men on June 23, 1934. This is only direct employment on the roads and does not include workers indirectly employed in quarries, mills, factories and transportation of road materials, the number of which is estimated at nearly twice the direct employment.

Juries Protect State Against High Valuations in Condemnation Suits

FORCED to proceed in condemnation because of demands for right of way which were considered exorbitant, the Department of Public Works is gratified at the attitude taken by juries in three recent cases in Los Angeles and Alameda counties. One of the cases was of particular importance because it resulted in a decision by Superior Judge Thomas P. White of Los Angeles County that the State, in its sovereign capacity, may condemn cemetery property for highway purposes, despite the provision in the General Cemetery Act prohibiting the taking of such areas for public purposes.

In the case entitled *People* vs. *Pearce et al.*, on Route 26 at the easterly city limits of the city of Los Angeles, a right of way 100 to 136 feet in width was condemned across an area which the owners claimed had been dedicated for cemetery purposes but which had not yet been improved as a cemetery.

COURT UPHELD STATE

The State attacked the dedication as irregular and ineffective, in view of the fact that the board of supervisors of the county of Los Angeles had rescinded its action in approving and accepting a map of the area. The superior court decided, however, that the dedication of the cemetery was legal but that, despite such dedication, a portion of it could be taken for State highway purposes.

In this case appraisers for the defendant cemetery association testified to values for right of way and damages as high as $125,000. Appraisers for the State testified to much lower values, and the jury brought in a verdict of $1,800. The area taken was approximately three acres. Considering real estate values in this area, this is considered a reasonable verdict.

LAND WAS DONATED

The department was particularly pleased with the fact that the jury was not impressed with the claims of the defendants, because of the fact that much of the right of way on this important project had been donated.

In the case of *People* vs. *Livingston,* also on Route 26, in the city of West Covina, Los Angeles County, the State required a small parcel of land at the intersection of Garvey Avenue and Glendora Avenue, containing about 159 square feet. The owners in their answer set up values as high as $12,000, and testified to values at the time of the trial.

The jury awarded the defendants $25 for the little tip of land taken and made no allowance for an alleged lease of the property, which provided for high rentals but under which no improvements had been made.

REASONABLE COMPENSATION

The case entitled *People* vs. *Weeks et al.*, involved two parcels of right of way on the Dublin Canyon project, Route 5. The two parcels were recently consolidated for trial before a single jury in the superior court for Alameda County with the following result:

The owners of one parcel asked compensation of $3,400 and were awarded $544 by the jury. The owners of the other parcel demanded $13,600 for compensation and damages and were awarded $850 for land taken, with no allowance for damages.

The verdicts are considered reasonable compensation for the areas taken. A motion for a new trial has been denied by the court.

The department, as a general policy, dislikes to force owners to condemnation, but in the cases mentioned the demands were considered so unreasonable that no alternative was presented. The results, however, fully justify the course taken and indicate that, when the facts are fairly and fully put before juries, reasonable verdicts may be anticipated.

He had gone into the library to put the thing up to her father, and she was anxiously waiting on the front porch.

"Well," said the suitor when he returned, "he asked me how I was fixed, and I told him I had $3,000 in the bank."

"And what did he say to that?"

"He borrowed it."

"A week after their wedding they were throwing crockery at each other," said a landlady in court recently. It is not every couple that settles down to married life so quickly.

Engineers Devise a Method to Prevent Steel Pile Corrosion

(Continued from page 4)

caps and throwback plate, is securely held in line by tie rods which extend to concrete deadmen back of the walls.

The life of these structures depends to a large extent on protecting the metal from the corrosive action of the salt water, and a great deal of time and effort have been expended by the engineers in the district endeavoring to determine the most effective methods of treating the piles.

Piling was unloaded from trucks and spread out in orderly rows on timbers placed as high on the beach as possible. Rust and mill scale were removed by wire brushing and quick drying prime coats applied. After the prime coats had dried, hot asphaltic coatings were applied to about ⅛" thickness. In order to protect these asphaltic coatings from chipping, during driving, the engineers designed special roller leads to keep the piles in line while driving.

SCOUR LINE PROTECTION

One of the greatest difficulties has been found to be with the 3 or 4-foot scour line where pebbles are hurled against the piling with terrific impact by the waves. Here the protective coating was soon worn off and other means of protecting the metal had to be worked out. As the time between tides was limited, a very fast drying primer was used after which fairly hot airblown asphalt was applied and slightly damp beach sand thrown against the asphalt. This coating was built up to about ¼" in thickness and so far has successfully resisted the erosive action of the waves.

On the whole, this type of structure gives promise of being a very economical method of protecting embankment slopes adjacent to the ocean, and should it continue to resist wave and tide action, as it has so far, will probably be used quite extensively in shore protection work where conditions are similar to those on the Ventura coast.

"You say that you are the sole support of a widowed mother, your father having recently been killed in an explosion. How did the explosion happen?"

"Mother says it was too much yeast, but Uncle Jim thinks it was too little sugar."—*Wisconsin Highways.*

Old Plank Road of Sand Hills Becomes a Museum Exhibit

By **I. G. THOMAS,** Office Engineer

A PORTION of the old plank road, that was constructed in 1915 and 1916 by the California Highway Commission and served in a semisatisfactory way, yet many times better than the shifting sands, to carry hot and weary travelers across the sand hills between Yuma and El Centro, is to be permanently preserved and made a part of a perpetual exhibit on the history of transportation.

The Ford Motor Company, through its local agents at Long Beach, made a request recently to obtain a portion of the old road. Director Earl Lee Kelly, upon learning the purpose of the request, granted the company permission to remove 100 lineal feet of the old road to Chicago where it is on exhibition in the Ford Building at the Century of Progress as a part of the exhibit showing various types of roads from the beginning of road history.

GIVEN PERMANENT HOME

After the fair, the old plank road is to be placed in the museum of the Edison Institute at Dearborn, Michigan.

This portion of a novel, yet indispensable type of road in its day, a boon to mankind during its existence across the shifting dunes of the desert sands, will be preserved, reminding those who may view it of the California highway builders who made it possible by the creation of a movable road for the early-day motorist to cross these sands in comparative safety, although with much annoyance and discomfort due to the necessity of using turnouts provided for passing at each half mile.

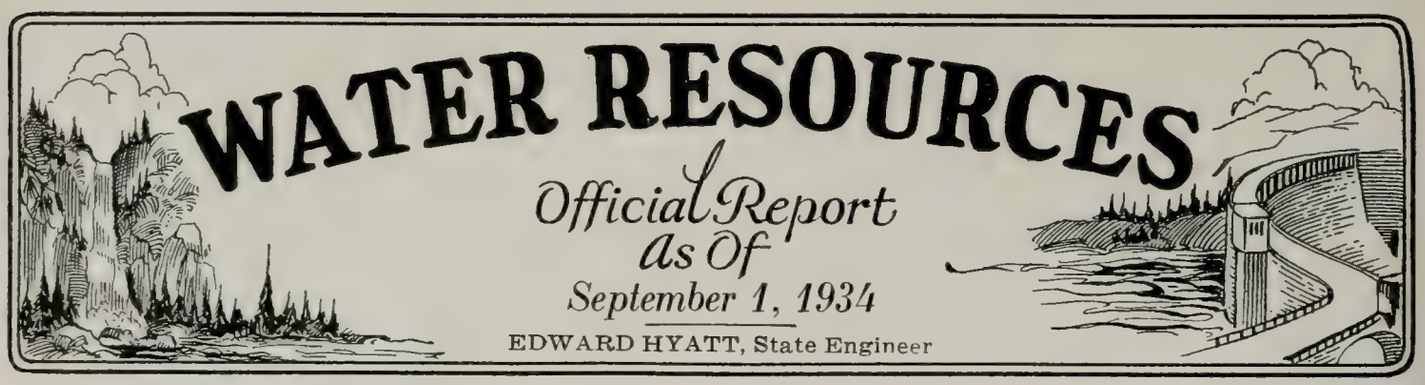
No part of the old plank road now remains in use, as it has been replaced with a modern asphaltic pavement laid on an embankment which has been so located and constructed that the drifting sands do not collect on the paved portion of the highway.

As one travels along the new road, portions of the old plank road are seen here and there reminding one of the days gone by when travel across this desert was something to be dreaded.

"Have you a skeleton in your closet?"

"No, it's out in the garage. I forgot to lock the doors last night and somebody took everything except two wheels and the frame."

OLD PLANK ROAD through the creeping sandhills of Imperial County as it existed in 1915 is shown at top. No. 2 shows a section of it reposing as a museum piece at the Chicago World's Fair. No. 4 shows a truck crew retrieving the section from its sandy tomb on the desert for the 2000 mile journey to Chicago. No. 5 is a scene on the modern paved highway that replaced the plank road and tamed the shifting sands.



The California District Securities Commission has approved the $10,000,000 contract between the Coachella Valley County Water District and the Federal government for the construction of the Coachella branch of the All-American Canal as a result of the investigation and report of the State Engineer.

The Commission has also authorized the issuance of bonds to the Reconstruction Finance Corporation by four irrigation districts totalling $2,375,000 for refinancing loans. Dam applications, flood control and other activities of the Division of Water Resources are given in the following monthly report:

IRRIGATION DISTRICTS

An investigation and report were made by the State Engineer on the proposal of the Coachella Valley County Water District to enter into an agreement with the United States for the construction of the Coachella Branch of the All-American Canal. The area to be served in the Coachella Valley by the proposed canal is about 140,000 acres and the cost of the work which the government agrees to do for the water district is estimated at approximately $10,000,000.

Inspection was made of the work proposed under a $225,000 loan and grant to the Modesto Irrigation District by the Federal Emergency Public Works Administration.

CALIFORNIA DISTRICTS SECURITIES COMMISSION

The Commission issued feasibility orders and authorized the voting of bonds to be issued to the Reconstruction Finance Corporation for refinancing loans as follows:

Alpaugh Irrigation District	$101,000
Lindsay-Strathmore Irrigation District	859,000
Oakdale Irrigation District	1,162,500
Paradise Irrigation District	252,500

Other orders and reports issued by the Commission were:

Coachella Valley County Water District—Approval of All-American Canal contract between the United States and the water district.

Lindsay-Strathmore Irrigation District—Approval of contract between district and Lakeside Ditch Company.

Nevada Irrigation District—Consent to expenditures from special reserve fund.

Palmdale Irrigation District—Consent to modification of refunding plan as heretofore approved; approval of readjustment plan under Chapter IX of the Federal bankruptcy act.

Palo Verde Irrigation District—Validation of refunding bonds.

South Fork Irrigation District—Approval of revised schedule of bond maturities.

Terra Bella Irrigation District—Approval of petition to proceed in the matter of exchange of refunding bonds under Chapter IX of the Federal bankruptcy act.

FLOOD CONTROL AND RECLAMATION

Sacramento Flood Control Project.

This office has been authorized by the Reclamation Board to move the Packer warehouse, located about six miles above Colusa, from the right-of-way upon which a levee is to be constructed by the California Debris Commission. This work is estimated to cost $4,275.

On July 30th clearing and grubbing work in the Sutter and Tisdale By-passes commenced with men from the Federal transient camps located in District 1500 and District 1660. During this period various numbers of men, varying from 62 to 100, have been employed. Tools are being furnished by this office and the transportation and other costs are being furnished from the Joint Navigation and Flood Control Project Fund, authorized by the Reclamation Board. To date the man-hours worked have been as follows: Stohlman Ridge, Sutter By-pass, 2424; Tisdale By-pass, 504; lower Sutter By-pass, 2972; total 5900 man-hours.

Commencing on July 26th an average of about 35 men have been engaged in clearing and grubbing work on the American River overflow channel, and to date approximately 5100 man-hours have been worked. Tools, powder and supervision are furnished from the Joint Navigation and Flood Control fund.

The California Debris Commission has finished plans for the completion of the three pumping plants on the Tisdale By-pass and bids will be called for within the next two or three weeks so that the plants will be ready for operation during the next rainy season. The total cost of this work is expected to be in the neighborhood of $300,000.

L. A. Asks $7,675,000 Water Permit

(Continued from preceding page)

WATER RIGHTS

Supervision of Appropriation of Water.

During the month of July, 46 applications to appropriate water were received, 13 denied, and 25 were approved. During the same period 7 permits were revoked and 5 passed to license.

Among the applications received were, one from South Fork Irrigation District proposing appropriations of 20 cubic feet per second and 1000 acre feet per annum from South Fork of Pit River and Clear Creek in Modoc County for power purposes, and two from the City of Los Angeles, one of which proposes an appropriation of 775 cubic feet per second and 60,000 acre feet per annum from Mill, Leevining, Walker, Parker and Rush Creeks in Mono County for power purposes, and the other a like appropriation from the same streams for municipal purposes at an estimated cost of $7,675,000.

Projects under permit were inspected preliminary to the issuance of license in El Dorado, Tulare, Kern, Los Angeles, San Bernardino, Riverside, Inyo and Mono Counties.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

During the past month the flow of the Sacramento River at Red Bluff has dropped to about the same flow as in August, 1931; that is, about 2600 second-feet. At Sacramento the minimum flow reached has been about 1000 second-feet and it is anticipated that there will soon be an increase in this flow due to decreased diversions upstream and to increased return flow and rice drainage. The flow at Sacramento on August 20, 1931, was 480 second-feet. The San Joaquin River near Vernalis has dropped to a flow of about 360 second feet during the past few days, compared to a corresponding flow in 1931 at this time of 200 second-feet.

Although the stream flow at Red Bluff is as low as in 1931, the combination of a considerably smaller rice acreage than in 1931 and the active conservation program which is being carried on has been instrumental in maintaining a much better flow of the river at Sacramento than in 1931. Routine measurements of diversions, stream flow, return flow, salinity, etc., have been maintained.

Salinity sampling at some fifty stations on the upper bay and in the Delta has been continued and weekly bulletins giving results of the tests are being mailed to Delta land owners. The following comparison of salinity at bay and Delta stations on August 14, 1924, 1931, and 1934, shows that the present season's encroachment of salt water is still considerably below the 1924 and 1931 encroachments. However, salinity in proportions dangerous to irrigation now extends above Isleton in the Sacramento Delta and to Bouldin, Venice and Mandeville Islands and Holland Tract in the San Joaquin Delta.

Comparison of Salinity at Bay and Delta Stations on August 14, 1924, 1931 and 1934

Station	*Salinity in parts of Chlorine per 100,000* 1924	1931	1934
Point Orient	---	1860	1820
Bullshead Point	---	1570	1580
Collinsville	970	1120	920
Emmaton	702	880	640
Rio Vista Bridge	462	660	360
Liberty Ferry	183	390	124
Isleton Bridge	310	545	200
Sutter Slough	36	320	20
Walnut Grove Bridge	29	220	7
Antioch	946	1090	800
Jersey	648	700	520
Central Landing	230	300	96
Southwest Point	---	390	68
Ward Landing	---	238	90
King Island Pump	66	102	48
Rindge Pump	78	120	33
Orwood Bridge	---	144	45
Middle River P.O.	81	180	47
Clifton Court Ferry	---	68	17
Whitehall	---	21	10

DAMS

Application was filed on August 13, 1934, for the enlargement of the Rodden Dam of the Oakdale Irrigation District, in Stanislaus County, at a cost of $4,000.

On July 12, 1934, applications were filed for the repair of Weaver Lake and Jackson Lake Dams in Nevada County. These applications were approved by the State Engineer on July 23d.

Construction of the Fallen Leaf Lake dam immediately below the outlet of Fallen Leaf Lake in El Dorado County is proceeding rapidly and will be completed prior to the end of the present construction season.

TOPOGRAPHIC MAPPING

Topographic mapping was in progress during July on the Paynes Creek Quadrangle in eastern Tehama County under the general State and Federal cooperative topographic mapping program. The Paynes Creek quadrangle is being surveyed as a Federal project.

WATER RESOURCES

Central Valley Project

The Water Project Authority met in the office of the Director of Public Works, chairman of the Authority, at 2.30 p.m. on August 2, 1934. The State Engineer, Executive Officer of the Authority, presented a report covering the activities undertaken in connection with the furtherance of the Central Valley Project since State election held December 19, 1933.

High P. C. C. Daily Output 914.1 Yards

(Continued from page 6)

minimum of mortar content consistent with workability required for satisfactory placement and reduction of cement content consistent with strength and durability would reduce shrinkage. This would be beneficial in reducing curling, due to unequal shrinkage of the top and bottom fibres, if the mix is placed and finished so as to be reasonably homogeneous throughout its depth.

PORTLAND CEMENT CONCRETE

PAVEMENT RECORDS

During 1933, contractors worked from 5 to 12 hours daily, and in computing average daily outputs we have reduced the hours worked to an 8-hour basis.

The **maximum average daily output** of concrete using one 27E mixer was placed on contract 47VC14, in Orange County between Irvine and Gustin, where the Griffith Company placed 460.1 cubic yards per day; W. D. Eaton was in charge as resident engineer with C. J. McCullough as street assistant. The average daily output per mixer for the entire State during 1933 was 390.6 cubic yards.

The maximum output for two mixers was on contract 44CN2 in Santa Clara County between Whisman Road and Lawrence Station Road where Basich Brothers placed an average of 914.1 cubic yards per day. This contractor was also high during 1932 when they averaged 880.7 cubic yards per day on a former Bay Shore Highway project. W. A. Rice was resident engineer and H. W. Purser street assistant.

BREAKING STRENGTH 5872 POUNDS

The **strongest concrete** pavement placed during 1933 was on contract 47CS11, in Ventura County between Santa Clara River and Ventura, where an average breaking strength of 5872 pounds per square inch was obtained. Kovacevich & Price were the contractors and F. B. Cressy was resident engineer, with P. L. Vaughn as street assistant. The average for the entire State was 4675 pounds.

The record for **cement control** was obtained on contract 45CN2, in Monterey County, 6 miles south of San Ardo to 1 mile south of San Ardo, with an average variation of 0.18 per cent; M. Bevanda was the contractor and V. E. Pearson resident engineer, with H. J. Doggart as street assistant. The average variation for the State was 0.80 per cent.

The record for **surface smoothness** was obtained on contract 47VC17, in San Diego County from Sorrento Creek to Del Mar, where the average roughness per mile was 5.0 inches. Griffith Company were the contractors and T. W. Voss resident engineer, with D. H. Greeley as street assistant. The average for the State was 9.4 inches per mile.

PLACING SELECT MATERIAL over oiled subgrade in Los Angeles County.

CONSTRUCTION METHODS AND DESIGN

During 1933, finishing methods were changed somewhat from that of the previous year in that all one-man floats were at least 16 feet in length. For final cutting, a steel bottom float was first used successfully by F. B. Cressy, resident engineer, on contract 47CS11, and later perfected under W. I. Templeton on contract 47FC5. It is of interest to note on the 1933 work that all projects with a roughness record of less than 7 inches per mile were given a final finish with a steel cutting edge float.

No material change was made in the mixture or pavement design for Portland cement concrete during 1933.

PLACING ASPHALT CONCRETE BASE COURSE on contract in Sacramento County.

Joint Seals

Some experimenting was done with copper seals in an attempt to prevent infiltration of water at the joints. These seals were first tried out to a limited extent on contract 47FC4, and later more extensively on contract 47VC20. At expansion joints the seals were placed over the joint filler and tightly crimped on by a special tool.

A 1-inch galvanized clip was placed over the copper seal at each end and the joint carefully banked up with concrete by hand immediately in advance of the mixer. After floating, the clips were removed. At weakened plane joints a 3-inch area on each side of the joint was trenched out of the freshly struck off concrete and the steel forming strip, with the copper membrane attached, set in proper position and backfilled.

The steel strip was then removed at the normal interval. The copper membranes in each case were trough-shaped with wings slanting upward into the ends of the slabs on each side of the joint, the bottom of the trough encased the top of the joint filler at expansion joints and lined the bottom of the surface groove at weakened plane joints.

Joint Drains

Drains under designed joints were tried experimentally during this season. They consisted of trenching the prepared subgrade directly under the joint and making watertight with building or tar paper or by sealing with hot asphalt and backfilling with porous material.

Bulk Cement

Bulk cement came into use extensively for the first time in pavement construction this season, being used entirely by Jahn & Bressi, contractors on the 26.5 miles of 30-foot paving of the Ridge Route Alternate in Los Angeles County.

Light-weight Aggregate

On contract 44TC8, in San Mateo County, experimental test sections were constructed using light-weight aggregate, 42-54 pounds per cubic foot, as a trial for possible use on the upper deck of the San Francisco Bay Bridge. This work was under the supervision of the materials and research laboratory. On this same project two short sections were laid using 4 and 5 sacks of cement per cubic yard. The amount of material in the fine aggregate passing 30 mesh was increased along with the decrease in cement.

Mesh Reinforcement

On contract 44CN2, in Santa Clara County, mesh reinforcement was used with two pavers on the 20-foot strip, one ahead of the mesh placement and one behind, with a finishing machine striking off the base course ahead of the mesh placement. Contracts 44CN2 and 44TC6 were constructed by Basich Brothers simultaneously as though they were one project, one contract having full mesh reinforcement and the other standard bar reinforcement. Slightly better progress was made on the mesh section than the bar section.

Membrane Curing

Considerable bituminous membrane curing in lieu of the standard water cure was permitted on about 39 miles of pavement including 26.5 miles of the Ridge Route Alternate.

On work in District IV a broom mounted on wheels riding on the side forms and spanning the entire width of the pavement was used as a final operation to improve the appearance of the slab. This was used after the pavement was given the final cut with a steel shod float, and was immediately preceded by a fine spray of water from a hose by hand.

ASPHALT CONCRETE

PAVEMENT RECORDS

The 1933 maximum average daily output of 968.7 tons was laid on contract 47VC13, in Los Angeles County between Las Flores Canyon and Santa Monica Canyon. Palmer and Holland were the contractors and J. M. Lackey resident engineer, with A. W. Carr as street assistant. The average daily output for the entire State was 663.6 tons. This same project

(Continued on page 28)

Detailed Figures of Construction Records

PORTLAND CEMENT

District	County	Route	Section	Location	Miles	Contract	Contractor
IV	Alameda	5	B	Dublin-Castro Hill	6.7	44TC7	Union Paving Company
	Contra Costa	14	B	San Pablo-Carquinez Bridge	1.9	44EC7	Basich Bros.
	San Mateo	68	A	San Francisco-South San Francisco	3.1	44TC8	Basich Bros.
	Santa Clara	68	A	Oregon Ave.-Whisman Road	4.7	44TC6	Basich Bros.
	" "	68	A. B	Whisman Road-Lawrence Sta. Road	3.5	44CN2	Basich Bros.
V	Monterey	2	H	6 Mi. S. of San Ardo—1 Mi. S. of San Ardo	5.0	45CN2	M. J. Bevanda
VI	Merced	4	C	Merced-Merced Airport	0.6	46CN2	C. W. Wood
	"	4	D	At Merced River Bridge	0.9	46TC4	N. M. Ball, Willard, Baisotti & Lovotti
VII	Los Angeles	4	A-I	Castaic School-Piru Creek	14.4	47FC4	Jahn & Bressi
	" "	4	I, J	Piru Creek-Gorman	12.1	47FC5	Jahn & Bressi
	" "	4	D	Gorman-Northerly Boundary	3.8	47CS13	Fredrickson & Watson
	" "	19	B	Brea Canyon-Pomona	6.2	47XC2	Griffith Company
	" "	19	B	At Brea Canyon Summit	1.3	47XC5	C. O. Sparks
	" "	23	D	Oaks-Vasquez Rock Road	1.5	27FC20	von der Hellen & Pierson
	" "	26	B	Mountain View Rd.-Orange Ave.	4.3	47XC3	Oswald Bros.
	" "	26	B	At San Gabriel River	0.3	47XC6	Oswald Bros.
	" "	26	C	Barranca St.-Pomona	6.1	47XC1	Griffith Company
	" "	60	F	Long Beach, State St.-Anaheim St.	0.8	47VC20	United Conc. Pipe Corp.
	Orange	2	C	Irvine-Tustin	5.6	47VC14	Griffith Company
	San Diego	2	A	Sorrento Creek-Del Mar	0.3	47VC17	Griffith Company
	" "	12	C	Chocolate Creek-Alpine	3.4	47CS9	T. M. Morgan Co.
	" "	12	D	Alpine-Viejas Creek	4.4	47CS10	T. M. Morgan Co.
	Ventura	2	C	Santa Clara River-Ventura	4.0	47CS11	Kovacevich & Price
	"	2	C	W. City Limits Ventura-Sanjon Rd.	1.6	67VC2	Kovacevich & Price
	"	2	C, D	Meta St., Peking-W. Hemlock St., Ventura	1.6	47V6	M. J. Bevanda
	"	60	A	Hueneme Rd.-Little Sycamore Creek	10.9	47VC11	J. L. McClain
VIII	Imperial	27	H	At Brawley	0.4	48VC7	B. G. Carroll
	Riverside	26	G	Avenue 74-Southerly Boundary	6.0	48FC2	United Conc. Pipe Corp.
	"	26	G	Avenue 62-Avenue 74	8.3	48CS2	Lee Moore Contr. Co.
	San Bernardino	9	C	Mt. Vernon Ave. Crossing, San Bernardino	0.2	48CS5	United Conc. Pipe Corp.
	" "	26	D A	Vineyard Ave.-Sierra Ave.	10.2	48CS3	United Conc. Pipe Corp.
X	San Joaquin	66		Manteca-Mossdale	4.3	41OTC4	Fredrickson & Watson
	Stanislaus	4	B	Hatch Crossing-Modesto	1.4	41OCN3	C. W. Wood
XI	San Diego	2	E	Broadway-Harasthy St. San Diego	1.8	47VC19	Griffith Company
				Total	141.6		
				Equiv. 20′ width	164±		

ASPHALT CONCRETE

District	County	Route	Section	Location	Miles	Contract	Contractor
II	Tehama	7	A	Southerly Boundary-Corning	8.9	42CN8	Hanrahan Company
III	Sacramento	11	B	Mills-Nimbus	4.5	23TC8	D. McDonald
IV	Contra Costa	14	B	San Pablo-Carquinez Bridge	7.2	44EC7	Basich Bros.
	Marin	1	C	Waldo-Sausalito	1.3	44CN3	Peninsula Paving Co.
	San Mateo	2	A	Lawndale-Baden	0.2	44EEC5	Union Paving Co.
VI	Fresno	4	B	Church Ave.-California Ave., Fresno	0.7	46TC3	Union Paving Co.
	Kern	4	G	Union Ave.-Minker Spur	2.9	46CS2	Gogo & Rados
VII	Los Angeles	9	A	Tujunga-La Canada	4.0	47VC12	Griffith Company
	" "	60	A, B	Las Flores Canyon-Santa Inez Can.	4.1	47VC13	Palmer & Holland
	" "	60	C	In Redondo Beach	1.4	47VC15	Griffith Company
	Ventura	2	C	1.9 Mi. S. of Ventura-2.4 Mi. S.	0.5	47CS11	Kovacevich & Price
VIII	Imperial	27	B	Sand Hills-Araz Junction	7.8	48VC6	V. R. Dennis Co.
	Riverside	26	E	Edom to Indio	11.0	48CS4	Oswald Bros.
X	Stanislaus	4	B	In Modesto	0.3	41OTC5*	A. Teichert & Son
XI	San Diego	2	E	Barnett Ave–Balboa Ave.	4.4	47DC18	Griffith Company
					59.2		
				Equiv. 20. Width	74±		

*Hand spread job.

for 1933 on California State Highways

CONCRETE PAVEMENT, 1933

Resident Engineer	Street Assistant	Average strength of concrete, 28 days, pounds per square inch	Average yardage laid per 8-hour day, cubic yards	Average daily variation in cement, in per cent	Roughness index, inches per mile	Type of Equipment Used: Mixer	Type of Equipment Used: Finisher	District
W. A. Rice	F. W. Montell	5,216	453.9	0.90	11.7	Rex	Lakewood, Ord.	IV
E. E. Sorenson	E. W. Herlinge	5,276	371.3	0.87	17.5	Ransome	" "	
E. E. Sorenson	G. L. Beckwith	4,517	676.6	1.10	9.7	" (2)	" (2) "	
W. A. Rice	E. W. Herlinger	5,250	889.6	0.94	11.0	" "	" " "	
W. A. Rice	H. W. Purser	4,822	**914.1**	0.99	12.2	" "	" " "	
V. E. Pearson	H. J. Doggart	3,982	456.0	**0.18**	2.5	Foote	Lakewood, Ord.	V
F. M. Reynolds	F. E. Baxter	4,184	244.2	1.16	11.7	Foote	Ord	VI
W. H. Craft	R. M. Cooley	5,253	334.2	1.10	7.9	Koehring	"	
W. I. Templeton	H. D. Johnson	3,859	646.4	1.47	8.5	Rans.-Koehring	Lakewood, Ord.	VII
W. I. Templeton	H. D. Johnson	3,628	767.4	1.12	6.0	" "	" "	
F. A. Read	C. E. Abbott	5,360	435.9	0.95	7.9	Koehring	" "	
H. B. Lindley	C. J. Woodbridge	5,079	454.9	0.92	13.3	"	" (2)	
W. J. Calvin	G. H. Lamb	4,572	384.1	0.54	11.1	Ransome	Lakewood	
F. R. Pracht	G. H. Lamb	4,282	426.2	0.91	10.4	Rex	"	
L. R. McNeely	C. E. Abbott	5,463	375.8	0.48	10.7	Foote	"	
W. J. Calvin	G. H. Lamb	4,898	277.5	0.24	5.7	"	"	
C. N. Ainley	G. H. Lamb	5,600	515.2	0.45	11.8	Koehring (2)	" (2)	
R. J. Hatfield	W. C. Holmes	5,070	457.5	0.99	5.9	Foote	"	
W. D. Eaton	C. J. McCullough	5,494	**460.1**	1.38	9.7	Koerhing	" (2)	
T. W. Voss	D. H. Greeley	3,367	278.5	0.58	**5.0**	Foote	"	
C. P. Montgomery	R. J. Allan	4,635	312.3	0.90	7.5	Koehring	Ord	
E. L. Sietz	J. Fleharty	4,899	328.3	1.01	7.6	"	"	
F. B. Cressy	P. L. Vaughn	**5,872**	389.8	0.60	11.6	Ransome	Lakewood, Ord.	
F. B. Cressy	P. L. Vaughn	4,555	186.1	1.26	10.9	Ransome	" "	
E. S. Gripper	G. F. Allen	4,110	445.0	0.46	14.1	Rex	" "	
T. W. Voss	D. H. Greeley	4,470	417.8	0.58	7.8	Foote	" "	
W. L. McFadden	F. R. Pearce	3,185	325.0	0.51	7.2	Ransome	Ord	VIII
J. M. Hollister	B. Nelson	5,423	453.6	0.31	11.7	Foote	Lakewood, Ord.	
R. C. Payne	B. Nelson	5,245	396.8	0.91	10.4	"	"	
J. M. Hollister	J. M. Cogwill	4,428	261.4	0.70	12.3	"	"	
R. C. Payne	B. Nelson	4,375	386.3	0.34	6.3	"	" Ord	
J. W. Cole	R. H. Lapp	4,927	426.5	0.40	8.0	Koehring	Ord (2)	X
G. R. Hubbard	L. E. Ford	4,372	357.5	0.87	8.6	Foote	"	
T. W. Voss	F. B. Stewart	3,311	334.4	0.94	5.8	"	Lakewood	XI
	Averages	4,675	390.6	0.80	9.4			

PAVEMENT, 1933

Resident Engineer	Street Assistant	Average tonnage laid per day	Average stability of surface mix, in pounds	Roughometer index of roughness, inches per mile	Type of Equipment: Mixing Plant	Type of Equipment: Finisher	District
C. F. Waite	W. M. Douglass	412.4	3,006	15.1	Standard	Ord 20′-2	II
J. D. Greene	J. P. Murphy	732.1	3,150	11.1	"	"	III
E. E. Sorenson	E. Carlstad	697.5	2,630	16.2	"	" 30′	IV
M. C. Fosgate	F. W. Montell	866.2	3,100	11.4	Geiger	" 20′-2	
W. A. Rice	E. Carlstad	442.0	2,175	40.6	"	Lakewood, 20′	
D. G. Evans	P. A. Boulton	740.4	3,658	19.4	Bodinson	" 30′	VI
H. B. LaForge	L. J. Low	373.4	3,160	16.4	Standard	Ord 30′	
R. D. Kinsey	A. W. Carr	741.3	2,970	13.8	Madsen	Special 30′	VII
J. M. Lackey	A. W. Carr	**968.7**	2,311	**9.6**	Standard	" "	
R. McNeely	T. A. Roseberry	567.3	2,750	15.0	"	Lakewood 20′	
F. B. Cressy	W. E. Melcher	242.0	**4,025**	18.5	"	Ord 20′	VIII
F. R. Baker	F. D. Pearce	722.6	3,448	16.0	Geiger		
J. M. Hodges	W. Ford	683.6	2,926	13.1	Standard	Ord	
C. M. Butts	J. F. O'Hara	154.4	3,560	36.4	Geiger	"	X
W. D. Eaton	Dan Porter	575.8	2,515	20.9	Standard	"	XI
	Average	663.6	3,026	14.9			

Plant Mix Oil Won Smoothness Test

(Continued from page 25)

likewise holds the record for **riding qualities** for the year, averaging 9.6 inches per mile of roughness. The average smoothness for the State was 14.9 inches per mile.

The best average **stability** of surface course mixture was obtained on contract 47CS11, in Ventura County between Santa Clara River and Ventura, with 4025 pounds. The average for the State was 3026 pounds.

CONSTRUCTION METHODS AND DESIGN

Stability requirements are now made a part of all specifications. Preliminary investigation of available materials for a project is made by the district and samples submitted to the laboratory. The materials are combined by the laboratory in the proportions necessary to produce the required stability, first consideration being given to the cost of materials delivered to the contractor, from information furnished by the field forces.

As an aid in the selection of sands, the laboratory makes use of the microscopical examination of the grains to determine their probable behavior in the stability test. Considerable can be learned of the possibility of sands by observing the shape and angularity of grains and their surface characteristics.

Paving is then started with the approved materials and during the progress of the work daily samples of the mix are submitted for control purposes. The materials quite often require adjustment from time to time to keep stabilities within requirements.

Mixture Design

In the design of mixture, the amount and grading of coarse aggregate is that which will give the desired workability and surface texture. Closer textures must necessarily be run during the winter season than those for more seasonable construction. Likewise the penetration of the asphaltic cement is adjusted for the season of year in which the work is to be done.

For work constructed during the summer months the texture of the surface course is maintained as open as is considered safe for the given locality in order to develop maximum nonskid qualities. To insure against too open a mix for watertightness, the construction department has devised a quick method of making a permeability test of pavement surfaces, and the results of this test determine the minimum of fines to be used.

Filler Materials

Various fillers have been used during the past season in surface mixtures. Specifications are now prepared so as to permit the use of any filler material that will, in combination with the sand proposed for use, make the specified stability. The type of fillers to be used is approved prior to the start of the job.

Limestone dust will in general produce the desired result with nearly any sand; substitute fillers will often produce stability with one sand from a given locality but fail with other sands from the same general source. This makes necessary the combining of the individual sands with the particular filler the contractor wishes to use. This throws a considerable burden on the laboratory in excessive testing, and if the privilege is abused by the contractor the amount of work over and above that normally required is assessed to the contractor.

The most common substitute for limestone dust is diatomaceous earth, which is available along the Monterey coast. Considerable pumice material has been used in the San Joaquin Valley, where large deposits of this material are available. In the southern part of the State one contractor manufactures his own filler at a central plant from waste material of a commercial gravel producer.

OIL SURFACED ROADS

The plant mix type predominated in 1933, 86.9 miles of this type having been constructed as compared with 27.9 miles of road mix.

The record for smoothness for the plant mix type, 5.6 inches per mile, was obtained on contract 48VC4-28CS4 between Shavers Summit and Desert Center, Basich Bros., contractor, and E. A. Bannister resident engineer. The average record for the State for 1933 was 23.5 inches per mile. For road mix type, 10.3 inches per mile was obtained on contract 49CS3, Keough Hot Springs to Bishop, Hemstreet & Bell, contractor, W. S. Dolliver, resident engineer. The State average was 34.4 inches.

It is of interest to note that in 1933 the average roughness for plant mix was considerably less than that for road mix, which is the reverse of that of previous years. This improvement is due principally to the change in finishing methods developed for plant mix type. We are now holding in reserve, along the edges of the surfacing, enough uncompressed material to make approximately one inch of compacted surfacing. During finishing operations this loose material is bladed across the surface as it is being consolidated. This levels up the roughness which is the result of unequal consolidation during spreading and distortion in the loose material from construction equipment.

It has been our experience with the heavier types of binders, such as cutback asphalts, that cutting of the surface during consolidation to produce this loose material is very unsatisfactory, and the change in methods has resulted in a material improvement.

CONSOLIDATION DIFFICULT

An interesting project was constructed under contract 42TC10 between Canyon Creek and Hat Creek Summit, in which the binder was E grade asphalt, 150-200 penetration, without cutting back. Upon a prepared crusher run base, 3 inches of compacted material was laid, mixed at a temperature of 300° to 375° F. The grading of the aggregate was the same as that used for oil treated surfacing and consisted entirely of aggregate obtained locally. Consolidation was difficult to obtain with this mix and it was found necessary to seal the surface immediately with a cutback asphalt to make it impermeable.

The practice of making detailed tests of aggregates and oil mixtures in conjunction with the testing laboratory has been continued with most satisfactory results. Field design has been checked by laboratory tests for stability, soundness and swell tests, and the construction of these low type oil surfaces has been perfected as much as possible, largely through the excellent cooperation between the field and laboratory engineers.

DISCING AND HARROWING road mix oiling project in Monterey County.

OILED ROCK SURFACE, 1933

Road	Contract	Miles	Location	Contractor	Roughness, inches per mile
PLANT MIX					
II-Sha-28-D	42CN3	8.7	Hat Creek Summit-Fall River Mills	E. C. Coats	22.9
Sha-28-C, D	42TC10	10.2	Canyon Creek-Hat Creek Summit	T. M. Morgan Co.	32.0
III-Lak-15-B	23WC5	3.2	Manila Ranch-Bartlett Spgs. Road	Hanrahan Company	31.5
Pla-37-C, E	43TC8	11.5	Gold Run-Airport	Peninsula Paving Co.	31.8
VI-Tul-10-E	46VC1	8.5	Lemoncove-Three Rivers	Thompson Bros. (Hemstreet & Bell)	39.7
VIII-Riv-64-B	48VC4 28CS4	19.5	Shavers Summit-Desert Center	Basich Bros.	5.6
SBd-31-M, N	48VC5	16.5	Halloran Summit-Mountain Pass	Basich Bros.	18.9
SBd-43-A	48XC1	4.5	Camp Waterman-Arrowhead Spgs.	Jahn & Bressi	41.5
IX-Mno-23-C, D	49CS2	4.3	Whiskey Creek-Convict Creek	Southwest Paving Co.	23.9
		86.9		Average	23.5
ROAD MIX					
II-Las-29-C	42CN11	2.0	Susanville-Johnstonville	Hein Bros., Basalt Rock Co. & E. A. Forde	52.0
V-Mon-56-F, G	45WC2	8.7	Molera Ranch-Rocky Creek	Santa Maria Const. Co.	72.1
Mon-56-H	45WC1	3.7	San Remo Divide-Carmel River	Meyer Rosenberg	18.0
IX-Iny-23-D	49CS3	6.1	Keough Hot Springs-Bishop	Hemstreet & Bell	10.3
Iny-23-E	49CS4	3.9	Bishop-Round Valley Road	Basich Bros.	10.0
Iny-23-E	49CS5	3.5	Bishop-Owens River Canal	Basich Bros.	15.2
		27.9		Average	34.4

FIRST STATE ROUTE SIGN PLACED

The first of 6000 new numbered State highway signs, No. 1 on Highway No. 1, was installed at Carmel September 10, with a public celebration sponsored by Monterey Peninsula civic groups. The exact point was Carmel Hill, at the junction of Monterey, Pacific Grove and Carmel highways.

Under a cooperative arrangement with the State Division of Highways the signs will be posted in the south by the Automobile Club of Southern California and in the north by the California State Automobile Association.

HIGHWAY STOPS BRUSH FIRE

Stressing the point that the Angeles Crest Highway again proved its firebreak effectiveness by stopping the recent 3200-acre Arroyo Seco brush fire from spreading west, the Automobile Club of Southern California sent a communication to Earl Lee Kelly, State Director of Public Works, advocating the early continuation of this highway into the back-country.

"Had this fire spread into the densely-covered area west of the present 10-mile section of Angeles Crest Highway the loss to the watershed would have been incalculable," the statement says.

Longest Steel Plate Girders in State Placed at McConnell Subway Crossing

By **H. D. STOVER,** Designing Engineer of Bridges

RECENTLY opened to traffic, McConnell subway removes another hazardous grade crossing from the State highway system.

Located 16 miles south of Sacramento, on the Sacramento-Stockton link of State Route 4, the Golden State Highway, this structure carries the double tracks of the Southern Pacific railroad over the highway on three heavy steel girders.

The State highway crosses the tracks at an angle of 23° 34′ making 66° 26′ skew in the structure, thus requiring 103-foot girders to span the 34-foot clear width of roadway.

These girders were fabricated in the shop, and each girder was erected in place as a unit by the Southern Pacific forces. They are one of the longest and heaviest plate girders on the Southern Pacific system in California.

Approaching the structure by easy grades, the highway passes beneath the railroad with three traffic lanes. A five-foot sidewalk through one of the massive abutments provides for the safety of pedestrians.

WATER PROBLEM SOLVED

At the time the elimination of this grade crossing was first considered some years ago, it was deemed impractical to construct a subway due to proximity of the Cosumnes River. High water elevation of the river, records show, reaches to base of ties on the railroad at the site of the crossing. Open test pits were made and observations of ground water level were made for three seasons. It was found that ground water elevations did not vary as water elevation in the river rose and fell, but remained constantly at elevation 32. This made it possible, by raising the railroad track one and a half feet to construct a subway with legal vertical clearance of 14 feet and keep the paving above permanent ground water. The construction of dykes was necessary to prevent water from the river from overflowing into the subway.

The subway is kept dry of storm waters during the wet season by a system of pipes and perforated drains leading to a sump in which the two drainage pumps are located. These are electrically operated automatic centrifugal pumps capable of discharging a total of 800 gallons per minute.

A feature of this installation is the manner in which one of the drainage pumps is used in summer to provide water for irrigating the landscaped area of the subway.

A 10-inch well was sunk through the bottom of the sump to water-bearing gravel at a depth of 80 feet. Water from the well rises high enough to cover the pump runner so that no priming is necessary at any season of the year.

CONTROLLED BY VALVES

Valves controlled from the motor platform make possible the closing of the suction pipe to the sump and the opening of the suction pipe into the well, thus allowing the drainage pump to be used for bringing water from the well into an irrigation pipe leading to the landscaped areas when the shrubbery requires irrigation during the summer months.

A convenient arrangement also allows tank trucks to be filled for hauling water to roadside trees planted on either side of the road in this vicinity.

The grading, paving and the construction of the abutments and drainage system was done by the State under contract. The steel superstructure, track work and maintaining railroad traffic during construction was done by the Southern Pacific. The total cost of the work was approximately $151,000.

SAFETY EXPERTS WILL MAKE STUDIES IN CITY STREETS

The streets of Cleveland will serve as a traffic safety laboratory for police officials, motor vehicle administrators and other interested delegates during the Twenty-third Annual Safety Congress and Exposition, which will be held in that city, October 1 to 5.

On the afternoon of October 4, as a part of the Congress' Street & Highway Traffic Section program, several hundred delegates will make a bus tour to places of interest to traffic men.

ANOTHER SAFE CROSSING where railroad and highway formerly met at grade has been constructed on the Sacramento-Stockton link of State Route No. 4, sixteen miles south of Sacramento near McConnell Station of the Southern Pacific Railroad. No. 1 shows the wide, straight approach to the new McConnell subway. Nos. 2 and 3 picture the difficult operations of raising and placing the 103-foot steel girders necessary to span the 34-foot roadway. They are the longest and heaviest plate girders on the Southern Pacific System in the State. No. 5 is a close-up of the subway structure that permits three lanes of traffic under the railroad and provides a 5-foot sidewalk for pedestrians through one of the massive abutments.

Bids and Awards Made in August on Highway Contracts

KERN COUNTY—Between Fort Tejon and 1 mile north of Grapevine Station, 5.2 miles grading paving with Portland cement concrete. District VI, Route 4, Section A. United Concrete Pipe Corp., Los Angeles, $375,542; Southern Calif. Roads Co., Los Angeles, $342,902; Jahn & Bressi Const. Co., Los Angeles, $331,414; J. L. McClain, Los Angeles, $333,370; Fredrickson & Watson, Oakland, $386,922; Union Paving Co., San Francisco, $352,488. Contract awarded to Griffith Company, Los Angeles, $320,753.50.

KINGS COUNTY—Building reinforced concrete box culvert at Melga Ditch; a two 31-ft. span reinforced concrete bridge at Lakeside Canal; widening existing bridge at Cross Creek. District VI, Route 10, Section A. Oscar Oberg, Los Angeles, $24,762; Ralph A. Bell, Los Angeles $26,028; So. Calif. Roads Co., Los Angeles, $22,524; Stroud Bros. and Seabrook, Bakersfield, $23,124. Contract awarded to J. W. Halterman, Willows, $21,208.20.

MONTEREY COUNTY—A reinforced concrete arch culvert to be constructed about 40 miles south of Carmel. District V, Route 56, Section E. Rocca & Caletti, San Rafael, $12,412; Force Const. Co., Oakland, $13,720; A. Soda & Son, Oakland, $13,950; M. B. McGowan, Inc., San Francisco, $13,162. Contract awarded to B. Rocca & Co., San Rafael, $11,382.50.

ORANGE COUNTY—Between Galivan & Irvine, between Huntington Beach and Newport, and on Hampshire Ave. in Huntington Beach, 15.3 miles to be treated with fuel oil. District VII, Routes 2, 60, and 171. Kovacevich & Price, South Gate, $10,256; Sunset Dec. Granite Co., West Hollywood, $11,581; Dimmitt & Taylor, Los Angeles, $13,008; H. E. Cox & Son, Pasadena, $13,567. Contract awarded to Gogo & Rados, Los Angeles, $9,956.10.

PLACER COUNTY & NEVADA COUNTY—23.6 miles bituminous surfacing. District III, various locations. E. F. Hilliard, Sacramento, $14,751; Tiffany Const. Co., Sacramento, $14,751; A. Teichert & Co., Sacramento, $14,850. Contract awarded to Lee J. Immel, Berkeley, $12,766.

RIVERSIDE COUNTY—Eschscholzia Ave. between Frederick and Graham Streets, 0.7 miles grading bituminous surfacing. District VIII, Route Feeder Road. Contract awarded to George Herz & Co., San Bernardino, $10,131.30.

RIVERSIDE-SAN BERNARDINO COUNTIES—Between Calimesa and Banning, 12.3 miles oiling. District VIII, Route 26, Sections B, A, B. Gogo & Rados, L. A., $10,906; Matich Bros., Elsinore, $12,210; Sunset Decomposed Granite Co., Hollywood, $10,845; Dimmitt & Taylor, Los Angeles, $11,514; George Herz & Co., San Bernardino, $11,530. Contract awarded to George Gardner & Sons, Redlands, $9,965.90.

SACRAMENTO-NEVADA-BUTTE COUNTIES — 28 miles bituminous treated surfacing. District III, various locations. E. F. Hilliard, Sacramento, $14,989; A. Teichert & Son, $14,900; Tieslau Bros., Inc., Berkeley, $13,314. Contract awarded to Lee J. Immel, Berkeley, $12,900.50.

SAN DIEGO COUNTY—Between Julian and easterly boundary, 18.1 miles to be treated with fuel oil. District XI, Route 198, Sections E, F, and G. Lambs Transfer Co., Long Beach, $6,960; Paulsen & March, Inc., Los Angeles, $7,520; Morgan Bros., Huntington Park, $9,000. Contract awarded to Gilmore Oil Co., Los Angeles $6520.

SAN DIEGO COUNTY—Escondido Creek bridge, four 45-ft. reinforced concrete slab spans on R. C. piles and abutments. District XI, Route 2, Section A. Ralph A. Bell, Los Angeles, $36,948; B. O. Larsen, San Diego, $37,978; John Oberg, Los Angeles, $38,452; Sharp & Fellows, Los Angeles, $39,460; So. Calif. Roads Co., Los Angeles, $41,745; Bodenhamer Const. Co., Oakland, $39,803; R. R. Bishop, Long Beach, $38,428; Contracting Engineers, Los Angeles $47,969; Byerts & Dunn, Los Angeles, $40,401. Contract awarded to Parish Bros., Hollywood, $30,953.

SAN FRANCISCO COUNTY—Harrison Street between 5th and 10th Streets, 0.7 mile to be widened and paved with Portland cement concrete and asphaltic concrete. District IV, Route 68. Union Paving Co., San Francisco, $91,592; Chas. L. Hamey, San Francisco, $94,604; Fay Improvement Co., San Francisco, $107,559. Contract awarded to A. J. Raisch, San Francisco, $78,836.26.

GOOD SAMARITANS OF THE HIGHWAY SERVICE

August 13, 1934.

Mr. S. W. Lowden, Division Engineer,
California State Highway Department,
Bishop, California.

My Dear Mr. Lowden: On August 10th, I was traveling up the mountain grade from Bishop toward Schober's Ranch, when at the number two dam of the Southern Sierra Power Company plant, my automobile developed some serious engine trouble, which could not be repaired without assistance from someone other than myself.

Your Mr. Carl Cleland and Mr. Jack Reger happened along at the time, saw my plight, and rendered assistance such as was invaluable. They not only helped me locate my trouble but they saw that I got to Bishop, into the hands of capable, honest mechanics, my faulty engine parts repaired and back up the mountain to my car, where I installed the parts and got my car on its way again.

If you will place yourself in my position, you will realize how much this help meant to me and will realize just why I want to bring this matter to your attention. California can well be proud to have such men in its service and it is my hope that I may some day be able to repay these gentlemen for their great kindnesses.

Yours very truly,

(Signed) WALTER L. McKEE,
Los Angeles, California.

SANTA BARBARA COUNTY—Reinforced concrete bridge over existing State highway at Las Positas Road at the limits of Santa Barbara, consisting of one 62-ft. span and one 22-ft. cantilever span. District V, Route 2, Section S.B. DOC Construction Co., Santa Barbara, $13,690; David J. Reed & Jos. Maiser, Los Angeles, $15,530; Oscar Oberg, Los Angeles, $13,681; Louis C. Seidel, Oakland, $15,777. Contract awarded to Theo. M. Maino, San Luis Obispo, $12,818.20.

SONOMA COUNTY—Planing existing asphalt concrete pavement between Guerneville and Sebastopol, 3.2 miles. District IV, Route 104. Contract awarded to Asphalt Pavement Planing Co., Oakland, $2,340.

YUBA COUNTY—In Marysville between the north end of D St. Bridge and Second St., 0.12 of a mile surfacing with bituminous crushed gravel. District III, Route 3, Section Mvl. A. G. Raisch, San Francisco, $3,386. Contract awarded to Hemstreet & Bell, Marysville, $2,942.

The auctioneer was trying hard to sell his stock of cigars.

"You can't get better, gents," he bellowed; "twenty-five in a box! You can't get better. I don't care how much you spend!"

Suddenly a voice put in from back of the crowd:

"He's right, folks," it said. "I had one last week, and I'm not better yet."

Wife: "John, you play golf altogether too much, you are neglecting your business."

Golf Nut: "The doctor says I must take my iron every day."—*Boston Transcript.*

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

HARRY A. HOPKINS, Chairman, Taft
TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
FRANK A. TETLEY, Riverside
DR. W. W. BARHAM, Yreka
C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

J. W. VICKREY, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego
General Headquarters, Public Works Building, Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights
A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
GORDON ZANDER, Adjudication, Water Distribution

DIVISION OF ARCHITECTURE

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P. T. POAGE, Assistant Chief
W. K. DANIELS, Administrative Assistant

HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Draftsman
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

14684 9-34 9750

CALIFORNIA STATE PRINTING OFFICE
HARRY HAMMOND, STATE PRINTER
SACRAMENTO, 1934

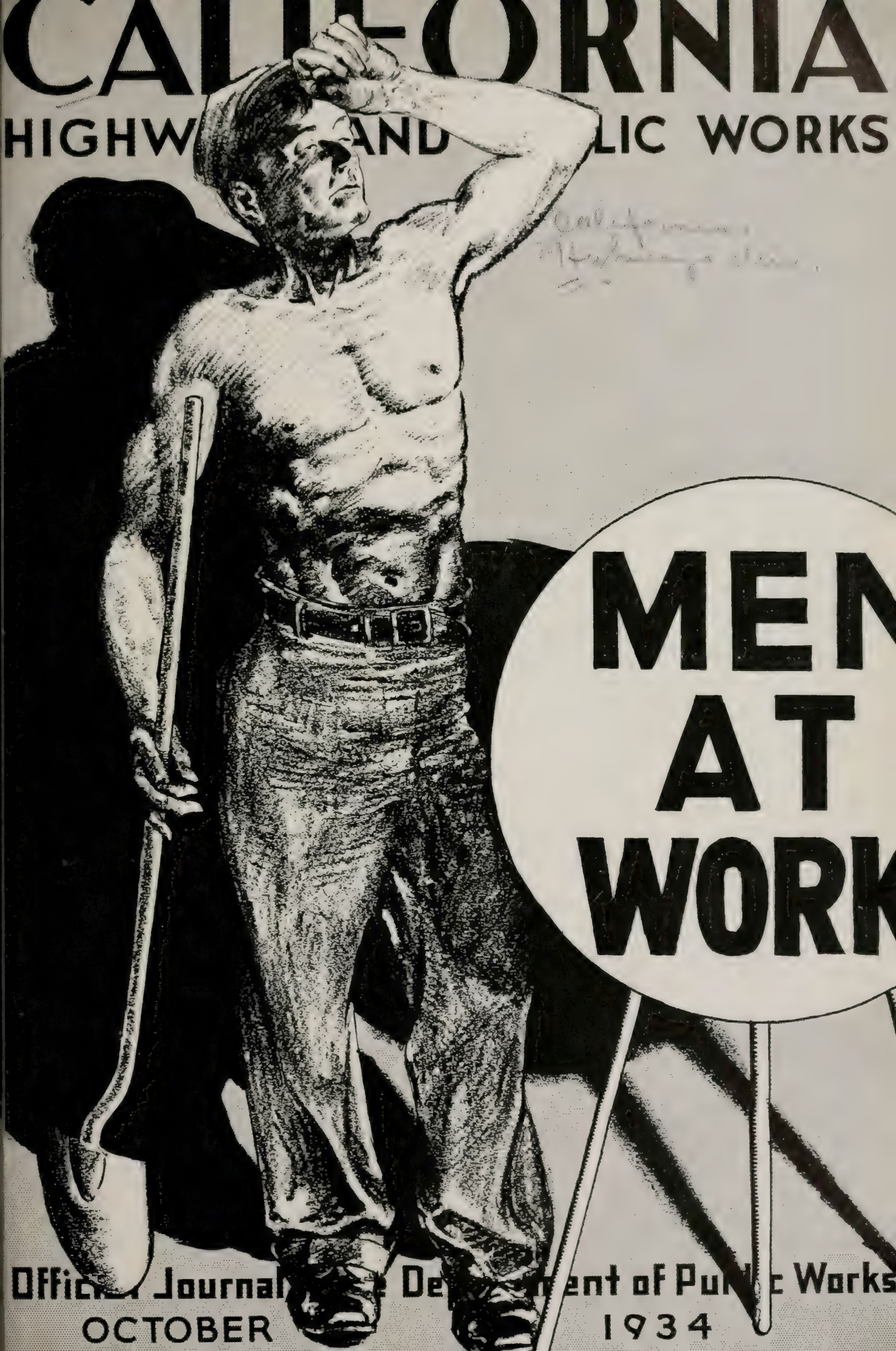
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

Seattle Public Library

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



Official Journal of the Department of Public Works

OCTOBER 1934

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12,900,000 Man Days Work

Assured on State Highways

By Governor Merriam

During Next Three Years

By **FRANK F. MERRIAM**, Governor of California

REMUNERATIVE work for the largest possible number of citizens of California on the highways of this State for the next three years without an extra cent of cost to the taxpayer is the program of this administration, which, I am happy to announce, is already well under way.

In recent conferences with the members of the California Highway Commission and with Director Earl Lee Kelly of the Department of Public Works, I have stressed the necessity for quick action to achieve this goal, and they have nobly responded. On September 7th the Highway Commission allocated $1,000,000 to keep at work on maintenance crews through the winter 3200 heads of families with some 12,000 dependents who would otherwise have been thrown back upon the charity rolls of their various communities. The money for this fund comes from accrued savings on contracts during the past two years.

FRANK F. MERRIAM

The commission now informs me that it has allocated funds in the sum of $2,012,000 for 12 projects representing 25 per cent of the highway improvements to be financed from the $7,932,206 Federal apportionment to California under the Hayden-Cartwright bill passed by the last Congress.

All projects selected for construction with these Federal funds in California must be submitted to the U. S. Bureau of Public Roads for approval. On the list appended to this article are the projects that have received such approval. Accordingly they are being advertised for bids, and contracts will be awarded and men put to work on these projects within a few weeks.

The number of man-days work that will be afforded to citizens of California by this first 25 per cent of recommended projects is estimated at 81,000 representing workers at jobsites, that is, men directly employed in work on the highways. In addition to these, workers in related industries share in the employment provided by these funds, such as men engaged in the manufacturing of highway building materials and supplies, in transportation of such materials and the operation of equipment. The ratio of this class of labor is approximately 2 to 1, making a total of 242,900 man-days work that will be provided by the first 25 per cent of these available funds.

Contracts will be awarded for the remaining 75 per cent as fast as the projects are approved by the U. S. Bureau of Public Roads so that it is fairly estimated that 1,065,600

(Continued on page 8)

State Completes New "Feeder-Road" Link of Junipero Serra Boulevard

By **JNO. H. SKEGGS,** District Engineer

JUNIPERO SERRA BOULEVARD is an arterial serving a large and rapidly growing traffic between San Francisco and points south, especially in San Mateo County. Traffic census for the boulevard taken in January, March and July of this year shows average counts of 10,129, with peak counts as high as 18,256 vehicles per day.

Junipero Serra Boulevard is the natural development resulting from the need of a common outlet for traffic converging in "the circle" which is made by a major intersection of West Portal Avenue, St. Francis Boulevard, Sloat Boulevard and Portola Drive.

From "the circle" southward to the county line the boulevard is part of the system of city streets. Near the county line Alemany Boulevard, another city arterial of high standard design, joins Junipero Serra. About one-half mile north of the Alemany intersection Junipero Serra is joined by the Nineteenth Avenue Extension, likewise of high standard construction as far north as the intersection with Sloat Boulevard.

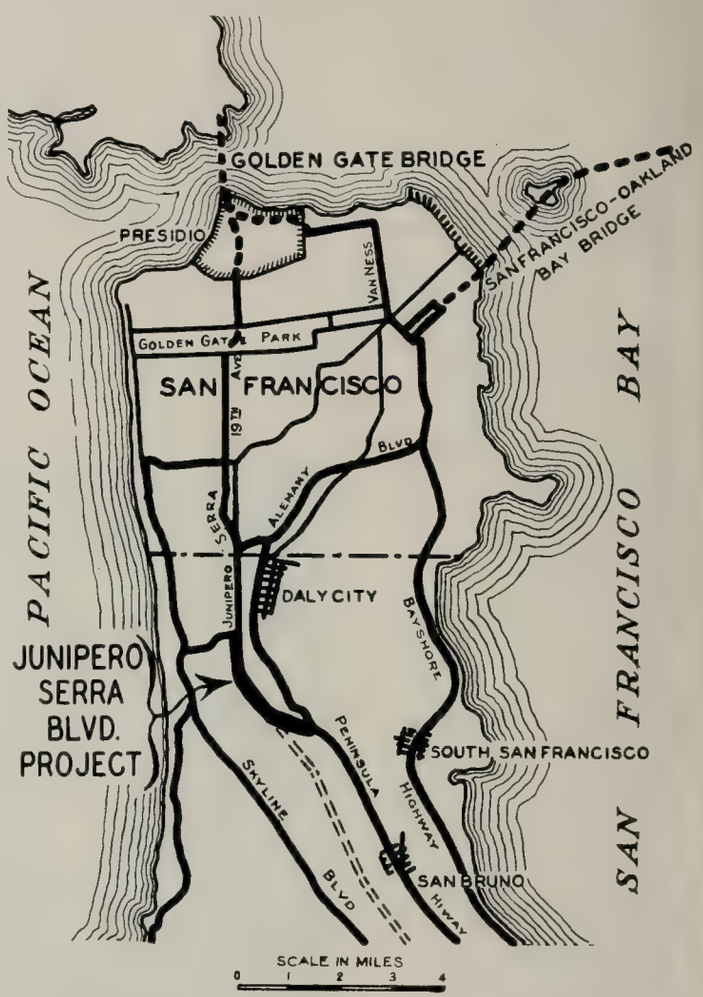
FEEDER ROAD LINK

From the county line southward Junipero Serra Boulevard is under jurisdiction of Joint Highway District No. 10 and stands in the relation of a "feeder" road to the State highways.

This great highway is in process of stage construction and now reaches southward more than two miles beyond Daly City, the last extension being a link 1.97 miles in length constructed by the State Division of Highways.

Outstanding features of Junipero Serra Boulevard are that it originates in the westerly borders of San Francisco's residential district and is in the natural line of a traffic outlet for a vast section of the city population. Likewise it is the natural routing for through traffic between the Redwood Highway of north bay counties and the highways of the peninsula of the bay via the Golden Gate Bridge.

As feeders to the boulevard are extended northerly, especially the major extension to reach the Golden Gate Bridge via Nineteenth and Funston avenues, traffic will be greatly increased.



TRAFFIC HAS INCREASED

Numerous other tributary streets feed this arterial, and central city areas contribute large volumes of passenger traffic via such important connections as Portola Drive and Alemany Boulevard, which, by reason of recent improvements, has nearly doubled its traffic.

For several years past this traffic has had no alternative but the connection to Route 2 (El Camino Real) via School Street in Daly City, thereby being forced to combat a dangerous railroad crossing, two right angle turns and the congestion of business districts.

Junipero Serra Boulevard throughout has a right of way 125 feet or more in width. Its location and general setting are most favorable to continuance of a minimum number of intersections, and to the preservation of conditions essential to an arterial highway.

(Continued one page 16)

LATEST MODERN STANDARDS of highway construction are incorporated in the recently completed extension of Junipero Serra Boulevard, one of San Francisco's main arterials down the Peninsula. The new unit, 1.67 miles long, is graded to a width of 65 feet including a small berm on hills. The 40-foot pavement is 6-inch asphalt concrete on 4-inch crusher run base. The shoulders of 4-inch crusher run base have an oil bound surface and shoulder treatment is extended to adjacent gutters. Maximum grade is 5 per cent. Double striping marks the center of the four traffic lanes.

Director Kelly Pays Tribute to Fine Achievements of District Engineers

By **EARL LEE KELLY**, Director of Public Works

DURING the past year the Division of Highways organization has conducted the largest highway construction program ever inaugurated in California. With the opening, in the summer of 1933, of the national program for intensive State highway construction as a means towards recovery, California stepped to the front and on August 25th issued a call for bids on fifty contracts, which were estimated to cost over $4,000,000 and which covered work on 470 miles of State highways.

The intensive construction program thus begun, was continued throughout the year with the result that between August 25, 1933, and October 1, 1934, 332 contracts for construction on the State highway system were awarded by the Department of Public Works. These contracts involved the expenditure of some $26,700,000 on improvement to approximately 2850 miles of State roads and construction of 105 bridges.

DISTRICTS PREPARED WORK

This mammoth construction program was accomplished only by the unified effort and cooperation of the entire organization of the Division of Highways. One of the most important factors in making possible the achievement was the concentrated work of preparation, performed in each of the eleven districts of the Division under the direction of the District Engineers.

It was the "will to do" which these executives threw into the work of the districts so that in phenomenally short periods projects were prepared from preliminary surveys to completed plans. It was the enthusiastic spirit with which they tackled the job and which was transmitted to their assistants that made possible the beginning of the contracts which brought relief to thousands of unemployed throughout the State.

That the highway construction achievement during the past year as California's part in the national program of recovery has been so successfully accomplished, is indisputable evidence of the ability of the district engineers of the Division of Highways.

Because of the outstanding performance of these engineers in the conduct of the affairs of their several districts, it is with great pleasure that I here acknowledge the debt of the administration to them and express the deep appreciation which is felt by California for their splendid service to the State.

The district engineers of the Division of Highways' eleven districts who have so ably acquitted themselves are:

DISTRICT I.

J. W. VICKREY, with headquarters at Eureka.

Mr. Vickrey entered the service of the Division of Highways as a transitman in April, 1917, assigned to the district of which he is now the chief executive, In 1920 he resigned, but returned to State highway work a year later as construction engineer for District III. 1926 saw him promoted to District Maintenance Engineer, and in 1929 he was chosen to fill the vacancy in District IX caused by the retirement of District Engineer F. G. Somner. On September 1, 1933, he was transferred from Bishop to his present position as the head of District I. Mr. Vickrey came to California from the staff of the Los Angeles County Surveyor.

DISTRICT II.

F. W. HASELWOOD, with headquarters at Redding.

Mr. Haselwood is one of the old time employees of the Division and entered the highway service February 19, 1912, after completing important hydraulic power investigations for the State Board of Control. He began his highway career as a chief-of-party in District I and was almost immediately promoted to the position of Assistant Engineer for the district, which title he held for eleven years. After a year in headquarters office he was appointed District Engineer of District III. In 1929, Mr. Haselwood was transferred to the same post in District I and on the first of February, 1932, he assumed his present duty as administrator of the affairs of District II.

DISTRICT III.

C. H. WHITMORE, with headquarters at Marysville.

Mr. Whitmore left his duties as Assistant State Highway Engineer for the State of Oregon to become the Assistant District Engineer of District IV in San Francisco on September 15, 1923. In 1928, he was made District Engineer of District I and on June 1, 1929, he was transferred to the post he now holds as District Engineer of District III.

(Continued on page 22)

State Highway District Engineers

Firestone Boulevard Bottleneck in Graham Widened and Open to Traffic

By **S. V. CORTELYOU**, District Engineer

FIRESTONE BOULEVARD, sometimes known as Manchester Avenue, which was taken into the State highway system August 21, 1933, will be one of the principal traffic arteries connecting the Coast Highway, the southerly portion of Los Angeles and contiguous territory with Anaheim, Orange and Santa Ana when contracts and contemplated improvements on this route are completed.

Prior to its inclusion in the State highway system, Manchester Avenue, as the western part of this route is known, was improved for its full width with permanent pavement, curbs, and gutters, and for the major portion with sidewalks and street lights, from Inglewood east to Central Avenue.

From Central Avenue to Alameda Street, in the unincorporated community of Graham, a bottleneck existed which greatly restricted through traffic on this route.

OLD SURFACING TOO THIN

For the first 600 feet east of Alameda Street past the Firestone Tire and Rubber Company plant the old highway was wide enough to accommodate present traffic, but the surfacing was only a thin bituminous mixture, too light for the heavy traffic of the boulevard.

From the end of this portion which had the light surfacing to Santa Fe Avenue and from Atlantic Boulevard to Downey there was a full width improvement. From Downey to Artesia, in Orange County, there was no direct route, travel following existing county roads, which in general run either in a north and south or east and west direction.

With the adoption of the route from "Route 60 (Coast Highway) to Main Street, Santa Ana, via Manchester Avenue and Santa Ana Boulevard" as a State highway, it was apparent that the first step in its logical development was the elimination of the bottleneck condition in the community of Graham, between Central Avenue and Alameda Street.

This section, which is 1.49 miles in length, was already graded to a roadway width of 70 feet with curbs at variable distances from the center line along the westerly portion between Central Avenue and Compton Avenue; on the easterly portion, from Compton Avenue to Alameda street, there was an old concrete pavement 40 feet wide, which was too narrow for the heavy traffic of this route, and was in a very rough condition.

Plans for the improvement of this section were prepared by the Los Angeles County surveyor and road department. The State Division of Highways opened bids in December, 1933. Work was started under a State contract in January, 1934, and completed August 11, 1934.

Work under this contract included construction of concrete curbs with concrete gutters six feet wide on each side. Concrete sidewalks were constructed wherever necessary to fill in gaps in previously existing sidewalks, which sidewalks were paid for by Los Angeles County. Asphaltic concrete pavement six inches thick was placed the full width between gutters on all portions not previously paved, and the old concrete pavement was resurfaced with asphalt concrete a minimum thickness of two inches to eliminate irregularities in the existing pavement and make the crown conform to present State highway standards. The width of roadway between curbs was increased to 74 feet.

COUNTY CONTRIBUTES $119,000

The county of Los Angeles contributed toward this project to the extent of securing additional land to make a 100-foot width of right of way and also paid the cost of relocating sewer connections, constructing sidewalks under this contract, and changing the lighting system. The county contribution toward the cost of construction was $19,000, and about $100,000 for the right of way. The State's share amounted to $120,000, or a total cost of construction for the portion from Central Avenue to Alameda Street of $239,000.

The increased traffic, resulting from the widening of Firestone Boulevard from Central Avenue to Alameda Street, with the further increases which may be expected when improvements are completed on other sections

(Continued on page 28)

TRAFFIC CONGESTION is eliminated on Firestone Boulevard in the community of Graham, Los Angeles County, by the completion of a fine, four-lane highway, 74 feet wide between curbs.

OLD BOTTLENECK CONDITION as it existed before the improvement is shown above. The old pavement was only 40 feet wide, much too narrow for the heavy traffic on this route. The section recently completed is 1.49 miles in length and has a right of way with 100 feet for the entire distance.

EXTENDING THE IMPROVEMENT for 600 feet east of Alameda street the original thin bituminous mixture surfacing, too light for the increased heavy traffic, is being paved to bring it up to the standards of pavement on either side of that short section.

Budget Projects Will Add More Jobs

(Continued from page 1)

man-days additional work will be under way within the next few months that will carry employment well over into next spring.

In the meantime the Highway Commission will be finishing the preparation of its next biennial budget for highway construction and maintenance during the 1935–1937 period.

From the present outlook the available revenues during the next biennium for State highway construction and maintenance from the gasoline tax, motor vehicle fees and Federal aid will provide approximately 11,592,000 man-days work.

From these two sources it will be seen that a total of 12,900,000 man-days work in connection with State highway construction and maintenance is well assured for the next three years.

It should be gratefully remembered that Harry A. Hopkins, chairman of the Highway Commission, Director Earl Lee Kelly and the California delegation in Congress, as well as many civic bodies throughout the State, worked hard to secure the Federal money for California highways.

FEDERAL GRANTS OPPOSED

Several bills had been introduced in Congress last March, all requesting federal appropriations for the continuation of needed highway construction throughout the Union to provide and maintain essential transportation facilities and further contribute to unemployment relief. Much opposition developed.

This opposition was called to the attention of the California Highway Commission at its meeting on April 6th. The commission thereupon passed a resolution urging Congress to make the grant and thereby prevent the unemployment of thousands of men in California with dependents. So serious did the situation appear that Chairman Hopkins and Director Kelly were immediately dispatched to Washington.

COMBINED EFFORTS SUCCEED.

The resolution of the Highway Commission urging Congress to pass the measure was immediately endorsed by numerous chambers of commerce and boards of supervisors throughout the State who rushed their indorsements to Washington, where Chairman Hopkins and Director Earl Lee Kelly were appearing before Congressional committees and government engineering boards, explaining and urging the needs of the appropriation for California. These combined efforts finally resulted in the passing of the Hayden-Cartwright bill for which every member of the California Congressional delegation voted.

The projects for which allocations have been made by the Highway Commission following approval by the U. S. Bureau of Public Roads, all conform with the restrictions imposed by the Federal government in making the grant. These conditions provide that 50 per cent of the funds must be used on roads in the Federal aid system; 25 per cent for roads on the Federal aid system within municipalities and 25 per cent on feeder or secondary roads not in the Federal aid system. The list of projects thus far approved is as follows:

STATE HIGHWAY EXECUTIVES CONGRATULATED ON LOW COSTS

LOS ANGELES CHAMBER OF COMMERCE

Los Angeles, California,
October 8, 1934.

State Highway Commission,
Public Works Building,
Sacramento, California.

Gentlemen: Our attention has been called to the cost of administration of the various highway districts in the State highway system, and we wish to congratulate your honorable body upon the low costs that you are able to maintain and, particularly, wish to congratulate S. V. Cortelyou, District Engineer of District 7, which includes this territory, for having the honor of maintaining the lowest ratio cost in the entire State.

Once again we wish to express our appreciation of Mr. Cortelyou's whole-hearted cooperation with us at all times and feel that the interests of our highway needs in the county of Los Angeles are in particularly good hands.

Very truly yours,

LOS ANGELES CHAMBER OF COMMERCE.

(Signed) A. G. ARNOLL,
Secretary and General Manager.

Federal Budget Projects Approved

ROADS ON FEDERAL AID HIGHWAY SYSTEM OUTSIDE OF CITIES

County	Road	Description	Miles
Fresno	VI-Fre-4-A	Selma to Fowler Switch Canal Grading and paving	1.0
Plumas	II-Plu-21-A	Rock Creek to Storrie, grading North Fork Feather River Bridges at Tobin, Storrie and Rock Creek	2.5
Shasta	II-Sha-3-B	N. approach Sacramento River Bridge at Redding Grading and paving	
Santa Barbara	V-SB-2-E-D	Nojoqui Grade, Grading and paving	3.7
Los Angeles	VII-LA-4-E	Oak Glen to Saugus Grading, bridge and paving	4.4

ROADS ON FEDERAL AID HIGHWAY SYSTEM WITHIN CITIES

County	City and State Route	Description	
Alameda	Oakland 5	Moss Ave.-Webster to Santa Clara and Harrison Grading and paving	
San Mateo	Daly City 2	Daly City to Colma (Mission St. to Junction San Jose and Mission) Grading and paving	1.2
Shasta	Redding 3	S. Approach Sacramento River Bridge Grading and paving	
Los Angeles	Long Beach 60	Loma Ave. to Hathaway Ave. (State St.) Grading and paving	0.5
San Bernardino	Colton 26	I Street, Grading and paving	1.4

SECONDARY OR FEEDER ROADS NOT ON FEDERAL AID HIGHWAY SYSTEM

	Secondary State Highways	Description	
San Mateo	IV-SM-105-A	Skyline Blvd. to Half Moon Bay, Grading and surfacing	2.7
Orange	VII-Ora-174-A	Manchester Ave.-Buena Park to Anaheim, Grading and paving	5.2

Methods of Preserving Roadside Trees in Cooperation with Public Utilities

By **E. S. WHITAKER,** Assistant State Arboriculturist

TO SAVE or to destroy? To balance or to butcher? To create or to allow nature to take its course? These three questions are linked inexorably with the beautification problems that daily confront the designers and maintainers of the roadside beauty of the highways of the State of California.

Existing trees are a problem when new alignments are being located. Existing trees are a problem when clearance of any kind is obstructed by their growth. New plantings may not be as easily located as is believed at first glance, for there are always the wires of public utility companies to be reckoned with.

Should a tree make way, either by removal or crown trimming to a line of wires, or should beautiful natural or planted trees have the right of way at the expense of the utility company?

Forester G. D. Blair, of the Consumers Power Company of Jackson, Michigan, presented a paper before the 1934 annual meeting of the Michigan Association of Municipal, County and Public Utility Foresters, dealing with this subject as seen through the eyes of the public utility company. Mr. Blair has very fairly met these questions and acknowledgment is made to his article, parts of which have been used verbatim herewith.

THE "CRADLE TREE," a masterpiece of tree butchery. Here the foliage has been repeatedly cut away to make a path of noninterference for seven rows of wires.

MAINTENANCE COSTS AFFECTED

It may be interesting to know that 25 per cent of all public utility customers, according to Mr. Blair, are at one time or another directly affected by trees through the lack of proper trimming for wire clearance. Also, that 15 per cent of all annual overhead line maintenance costs and 10 per cent of all line construction costs are directly accountable to trees. A broken limb or a wet leaf may hinder the reception of a message which has otherwise traveled thousands of miles successfully.

Overhead lines are a very important pulse of the nation, and to keep them open is to greatly further the welfare of the people. On the other hand, trees are the saviors of our hot valley regions, making livable a condition

AT CLOSE QUARTERS, with wires above tree growth, poles must be raised.

Tree Butchery by Linemen Prevented

(Continued from preceding page)

that is only existible without them. Then, too, they are appealing to the senses, attracting through their beauty tourists and visitors to side trips and extra days of vacationing.

The public wants more and better trees; the public utility companies want less expensive construction and maintenance costs on their overhead lines. Each of these interests may satisfactorily be served if the problem be given the proper attention at its origination. Each side should recognize and appreciate the involved interests of the other in the construction of lines and the planting of trees.

TREE BUTCHERY OBSOLETE

At the time of construction, it will probably be found much less expensive to fit the poles to the trees than to fit the trees to the poles and wires. The oldtime method of tree butchery, employed by construction gangs when placing wires, is no longer recognized.

Elements taken into consideration when placing wires are tree form, width of right of way, and the importance of the lines, before the wires are placed over, to one side, or under the trees. Of course, the utopian of all types of wire construction, so far as trees are concerned, is the laying of underground cables. This, however, is quite expensive in initial cost, and also is not used except when absolutely necessary because of the high wire maintenance cost in case of breakage.

Underground cables are not practical except in densely populated areas, in near urban districts or contiguous to some beautiful specimen or row of trees. Heavily insulated tree cable is ofttimes used to minimize trimming cost and to retain the natural shape of the tree crown.

TRIMMING REQUIRES EXPERTS

Wires placed directly over trees are in the least desirable location, for it is in the tops of trees that the greatest annual growth occurs. This necessitates a yearly trimming cycle which causes maintenance costs to be unnecessarily high and is detrimental to the natural form of the tree.

If it is necessary, in order to have proper clearance for a line, to remove growth from trees each successive year, it is evident that the line is not properly placed in reference to the trees and should be raised for more economical maintenance

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LEFT MISSHAPEN by the butchers this tree shows the effect of continual trimming for overhead clearance. Note the size of its crown in relation to the trunk.

AN IDEAL example of the ultimate desirable condition of tree and wire location is shown by this fine specimen—a thing of grace and beauty adorning the roadside.

Los Gatos-Santa Cruz Cut-off Dedicated at Inspiration Point

BRINGING the scenic and recreational resources of Santa Cruz County closer to San Francisco Bay and to all of northern California, the new Inspiration Point cut-off on the Los Gatos-Santa Cruz Highway was officially dedicated on Saturday, September 22.

A colorful ceremony attended by over 1000 people marked the opening of the new high-standard route. A begonia-studded barrier of redwood leaves, representing Santa Cruz County's flowers and forests, was held by a group of bathing beauties, typifying the county's ocean beaches. Director of Public Works Earl Lee Kelly severed the strand at 2 p.m., and led the caravan of State officials and civic leaders out over the new route.

Chairman Harry A. Hopkins of the California Highway Commission and Commissioners Timothy A. Reardon, Philip A. Stanton and Frank A. Tetley were speakers at the dedication ceremonies and participated in the opening, as did Col. John H. Skeggs, District Engineer.

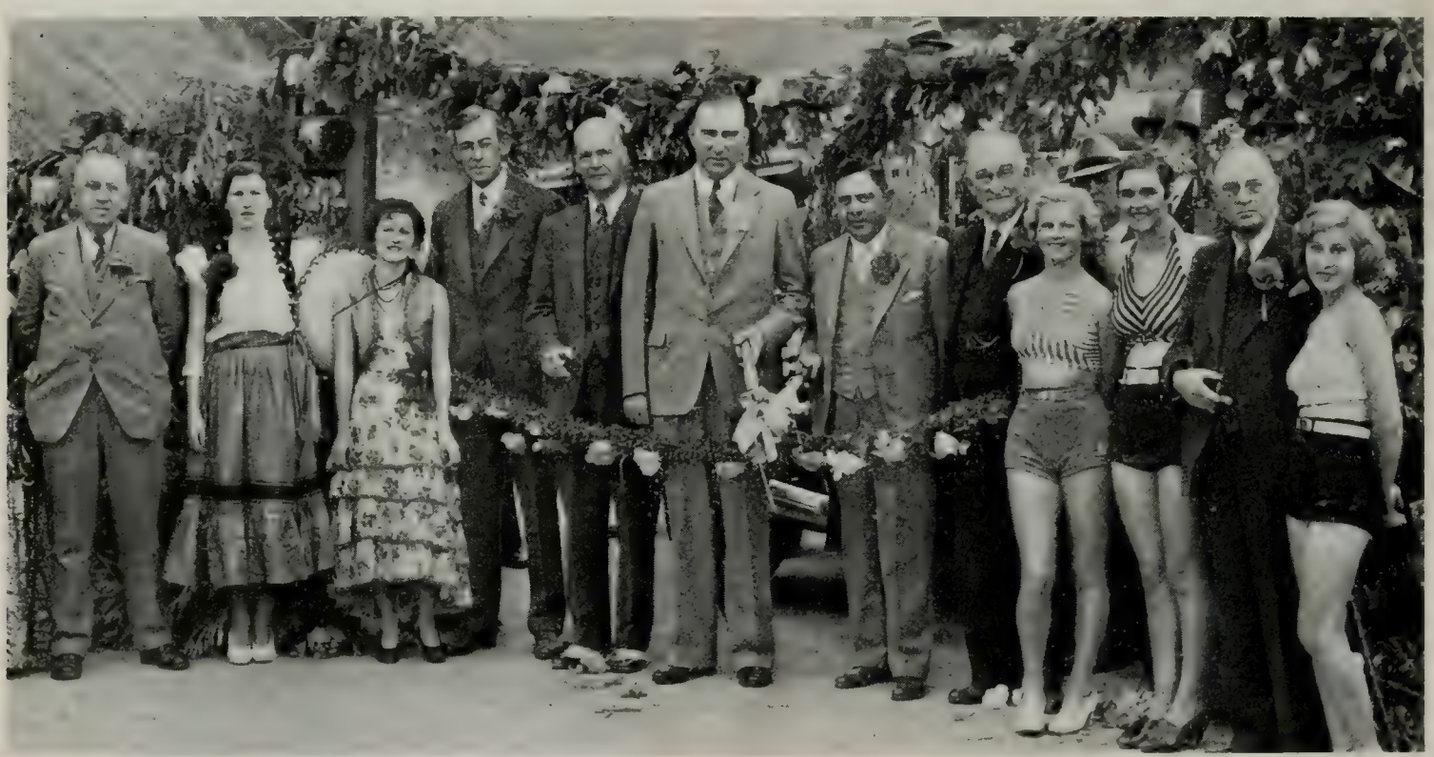
The State officials were guests at a luncheon at the Hotel Palomar in Santa Cruz, where the caravan formed to journey to Inspiration Point over the old road, escorted by Capt. Jack Payton of the California Highway Patrol and County Farm Advisor Henry Washburn.

At Inspiration Point, Mayor Roy Hammond of Santa Cruz gave a short address of welcome, and Fred McPherson, Jr., served as master of ceremonies.

Many civic and official bodies were represented at the ceremony, including the California State Chamber of Commerce, the California State Automobile Association, the Chambers of Commerce of San Jose, Santa Clara, San Benito County, Pajaro Valley, San Lorenzo Valley, Soquel, Highland and Salinas.

Senator Bert B. Snyder of Santa Cruz,

(Continued on page 26)



SHEARS IN HAND and flanked by officials, bathing beauties and Birthday Party girls Director Earl Lee Kelly is about to cut the ribbon officially opening the Inspiration Point cutoff. Left to right the officials are Highway Commissioner T. A. Reardon, District Engineer J. H. Skeggs, Mayor Roy Hammond, Chairman Hopkins of Highway Commission and Commissioners F. A. Tetley and P. A. Stanton.

INSPIRATION POINT CUT-OFF

a 6.67 mile relocation of the mountain section of the Los Gatos-Santa Cruz highway officially dedicated September 22d, replaces 8 miles of narrow winding road of 15-foot pavement. The new section strikes boldly through the mountains with huge cuts and fills. It is 46 feet wide through the mountains, 36 in the valley and surfaced with bituminous macadam.

Research Laboratory Forced to Build Extensions to Handle Increased Work

By **T. E. STANTON,** Materials and Research Engineer

THE 1922 Biennial Report of the California Division of Highways recited that in order to properly house and centralize the testing and research work, the California Highway Commission had erected a building to be known as the testing and research laboratory. This structure was a Class "A" building of brick, one story in height, with a spacious basement covering an area approximately 33 feet in width by 105 feet in length.

Current annual expenditures for highway construction and maintenance are more than double the expenditures of 1922, and more rigid control of construction and maintenance operations requires that the department handle more work in one year than in all the ten years preceding that time. The San Francisco-Oakland Bay Bridge has served to still further increase the work of the department.

FORCED TO ENLARGE

By the end of 1933 it had become exceedingly difficult to efficiently handle the work and it was found essential to enlarge the building facilities. This enlargement consists in extending the building by additions to both the east and west ends; the floor space in the additions approximating 5000 square feet.

The first floor of the easterly wing will be occupied by the aggregate and soils department.

The value of soil and foundation tests, which now occupy a prominent position in the work of the department, has received considerable recognition during recent years. The Materials and Research Department of the Division of Highways has kept abreast of the times not only in the performance of tests but also in the development of new equipment for the purpose.

CONCRETE TESTS INCREASE.

The basement of the east wing will house the concrete department, the work of which has been very materially expanded, not only on account of the increased volume of routine testing but also in the investigation and testing of the large number of special brands of cement which have been developed during recent years and are still in the process of development for special uses.

Less than ten years ago but one brand of cement, known as standard Portland cement, was used in concrete construction. We are today using considerable quantities of at least four grades, including standard Portland; high early strength; special sea water such as that used in portions of the Bay Bridge construction; and the high silica or blended type of cement.

The chemical department will occupy the first floor of the westerly extension, thereby enabling that department to better handle the increased volume of work, including the many additional chemical tests and analyses which have been developed in recent years to control the quality of materials entering into highway and bridge construction.

ASPHALTS AND ROAD OILS

The basement of the west extension will house the asphaltic concrete and road oil department.

The rapid development of the road oil, asphaltic cutback and asphaltic emulsion low-cost road construction has multiplied the work of this department several fold to insure that the best available material is used and the construction operations are properly carried out to the end that the greatest value of service may be secured for the expenditures made.

The work of the Materials and Research Department of the Division of Highways has received favorable attention not only throughout the United States but also internationally, as frequent requests are received for information from as far off as England, Germany, India and Australia.

MORE RIGID CONTROL

The tendency of recent years nationally and internationally has been toward the more rigid control of construction materials and operations through the materials and research departments. Along with the routine control and tests of materials has gone an extensive research program to develop new and improved methods to the end that more value

GROWING WINGS the Testing and Research Laboratory of the Division of Highways at 34th and Serra Way is expanding to take care of increased work. The wings add 5000 square feet of floor space.

of road service will be had for each dollar expended.

The cost of operating the Materials and Research Department, including all preliminary investigations, control tests of materials during construction, and research work of all kinds amounts to considerably less than 1 per cent of the total State expenditures for highway purposes. For this relatively small expenditure the Division of Highways is assured that only the best quality of materials enter into the construction of its State highways.

HUMBLE BEGINNINGS—The wooden shack housed the first laboratory in 1912. The concrete building was a later addition.

TWO BRIDGES BEING BUILT ON SAN MARCOS PASS ROUTE

On the San Marcos Pass Route in Santa Barbara County between the Santa Ynez River and Santa Ynez, a distance of 2½ miles, the road has been reconstructed with a 28-foot graded roadbed with an oil treated gravel surface 20 feet in width under the provisions of the NIRA.

Within the limits of the above project two bridges are under construction under the supervision of the Bridge Department, one across the Santa Ynez River, a reinforced concrete bridge having a total length of 765 feet with a 24-foot clear roadway; and one across Santa Agueda Creek, being a reinforced concrete bridge having a total length of 128 feet with a 24-foot clear roadway. It is anticipated that these bridges will be completed in November.

REAL EXPANSION came with this substantial brick building in 1922, now found inadequate.

Traffic Able to Avoid City Congestion

(Continued from page 2)

Tentative plans for extending the boulevard southward are ready when joint highway district funds for further construction become available.

STATE BUILDS EXTENSION

During the past summer the work of extending Junipero Serra Boulevard southward from junction with School Street in Daly City to Edgemar Road (a distance of 0.63 mile) was completed by Joint Highway District No. 10 at a cost of about $9,600, which cost included a concrete structure separating Washington Street from the boulevard.

At the same time the State has been constructing the "feeder" road extension southward from Edgemar Road, including a connecting link eastward to join El Camino Real (State Highway Route 2, U. S. Highway 101). This unit is a total of 1.97 miles in length, of which 1.6 miles is the boulevard and 0.37 mile is the connection to Route 2. The connection, however, is of the same high type construction as in the boulevard itself, and the finished project is one outstanding in attractiveness and serviceability.

TRAFFIC AVOIDS CONGESTION

Traffic is now able to avoid all conditions of city congestion and delay all the way from Sloat Boulevard and Portola Drive to the open road of Route 2 and its connections to the bay shore.

Construction of the section described in this article was commenced early in the spring of this year and completed in September. Location is all in open country over a terrain of low hills. Excavation, however, was wholly in soil consisting of sand tightly bound with an ideal admixture of clay, so that the resulting roadbed is compact and stable.

Curvature is light and 5 per cent grade is the maximum. The roadway was graded to a width of 65 feet, including side ditches and a small berm on hills.

Pavement consists of 6 inches of crusher run base 40 feet wide surfaced to the same width with asphalt concrete 6 inches thick.

The shoulders have a surfacing of crusher run base compacted to a thickness of 4 inches constructed as an oil bound surface by applying emulsified asphalt in three coats, three-quarters gallon per square yard total. The shoulder treatment is extended to cover adjacent gutters.

Cut slopes are uniformly 1:1 and rounded at the top.

In keeping with our policy of roadside beautification, and as a measure to prevent wind erosion of the cut slopes, the cut faces have been beautified with plant growth. Ice plant was used for the purpose and with complete success. Cost of the protection was about $0.05 per square yard of surface planted. This treatment results in beautifying as well as protecting the slopes.

BUILT WITH FEDERAL FUNDS

Roadway excavation amounted to about 280,000 cubic yards, all of which was required to build the embankments. The work was done with heavy crawler type tractors and wheeled scrapers of 12 cubic yards capacity. Average haul was about 1000 feet.

The contractor's price for earthwork was $0.13 per cubic yard, a remarkably low figure for the present high standard requirements in earthwork.

Total construction cost, including engineering, for this new section of the boulevard was less than $208,000 and the project was financed entirely from Federal government funds.

The heavy volume of traffic now using this connection to the city is sufficient testimonial to the fitness of the improvement.

PROJECTS UNDER WAY ON MORRO-FRESNO SECONDARY

Between Atascadero and Morro in San Luis Obispo County, from 6 miles east of Morro to the Atascadero Summit, a distance of about 3.2 miles, the road is being constructed with a 20-foot selected material surface on a 28-foot graded roadbed.

This project comes under the provisions of the NIRA. Plans are complete for the construction of a portion of this road within the limits of the Santa Barbara National Forest, a distance of about 4 miles.

These projects are a portion of the route between Morro Bay and Fresno, which was included in the secondary roads taken over from the county by the act of the Legislature.

Friend: "Why have you given the general such a peculiar pose?"

Sculptor: "You see, it was started as an equestrian statue and then the committee found they couldn't afford the horse."—*Brantford Expositor.*

Group Planting Assures Tree Growth

(Continued from page 11)

or placed under the tree, if the height of the lower branches permits.

In any case, the trimming should be done in such a manner as to disturb the natural growth of the tree as little as possible, consistent with adequate clearance. This trimming work, of course, should be done only by trained men with proper tools and the fundamentals of proper tree surgery should be followed in all cases.

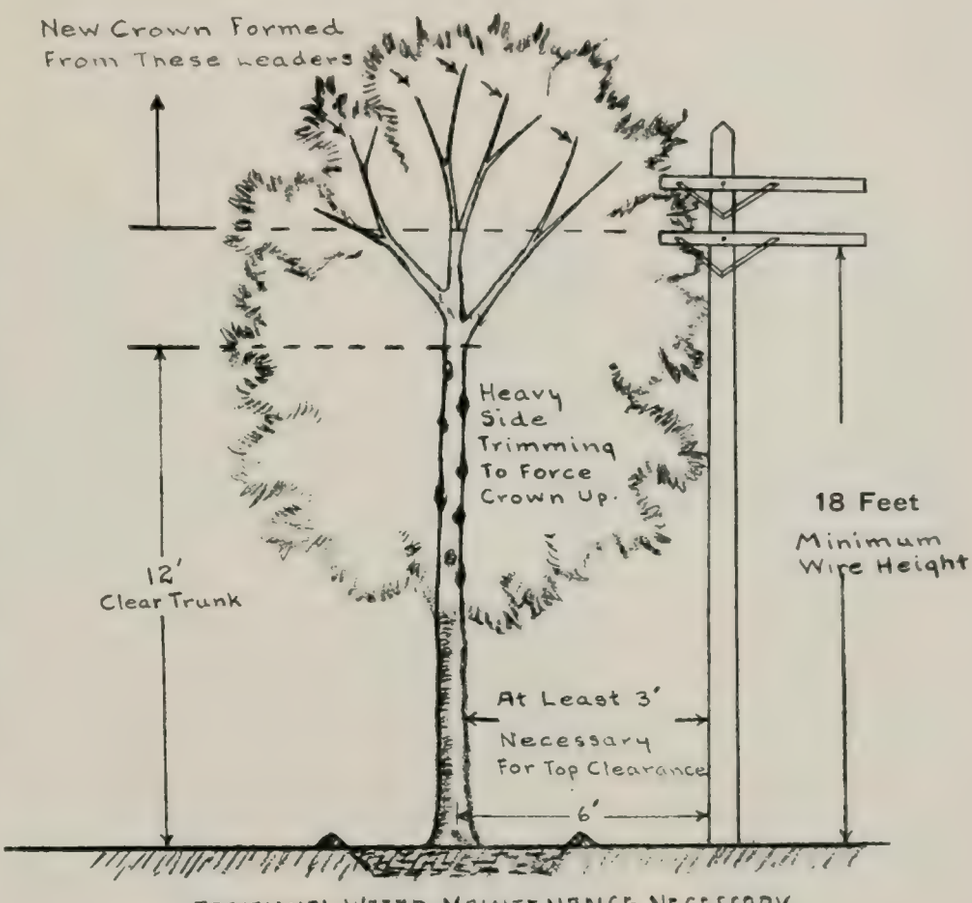
A possibility in solving the problem in rural communities and the country areas lies in the acquisition of extra right of way for the use of the pole line. This would cause tree interference to be practically nil, and would lessen the cost of wire maintenance through the use of lower wires. An extra width easement could nearly always be obtained from private parties if the use of this piece of land were explained to them.

The Maintenance Department of the Division of Highways, in coping with problems of tree and wire relationship, has grouped the work into three general classes in accordance to the trees to be worked on. These are: First, the large or matured trees; secondly, the young growing trees; and most important, the proposed plantings.

Under the first class is found the most usual type of wire clearance. Trees that are of large size are usually the ones that show the marks of tree butchery as practiced by linemen not so long ago. Wherever trees have reached the full height of the poles and have to be severely topped each year to maintain clearance, if possible, instead of raising the wires and so only prolonging an unescapable condition, the wires are lowered to the 18-foot minimum. At this level is usually found only clean trunks and lower branches; so that occasional water sprout growth is the only trimming maintenance needed.

Trees are sometimes found that have formed a semicircle of growth around the wires, caused by severe trimming of the growth under the wires with no effort made to shape up the tree as a whole by trimming any growth other than the branches or twigs that cause the interference. The result is a cradle-like hollow in which the wires rest, with growth on each side that in some cases has formed a full sized tree with a hole through the crown.

PROPOSED PLAN SHOWING THE TRIMMING WORK ON YOUNG TREES FOR WIRE CLEARANCE.


New Crown Formed From These Leaders
Heavy Side Trimming To Force Crown Up.
12' Clear Trunk
18 Feet Minimum Wire Height.
At Least 3' Necessary For Top Clearance
6'

ADDITIONAL WATER MAINTENANCE NECESSARY.

STATE REGULATIONS require 12 feet clearance between trunk of tree and the highway. Railroad Commission demands 18 feet minimum clearance between wires and ground. Pole is set 6 feet from trunk with 3-foot clearance for side-arms.

WIRES MUST BE RAISED

In a case of this kind, the first operation is the raising of the wires to allow a 40-foot minimum clearance. This height has been agreed upon as a minimum by the Division of Highways and the utility companies over trees. Heavy trimming of the side growth is then undertaken, leaving only the strongest and most upright branches. In the hollow where the wires formerly were, new growth will sprout, that in three or four seasons will fill this hollow.

The strongest of these are selected, the rest trimmed out, and the growth that remains is trimmed up to eventually form a new central framework for a new tree crown. In proper time the wires may be lowered to 18 feet, the minimum height for overhead wires to allow continued unrestricted growth of the new crown. This form of work is the most complete type of tree crown rehabilitation attempted in an effort to establish wire clearance because the

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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ---------- Director
JOHN W. HOWE ---------- Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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As Seen by an Editor

I wonder if many people beside myself have noticed as they drive over the county roads, recently taken into the State highway system as secondary highways, what the maintenance department of the Highway Commission has done to those roads to make them safer and more comfortable for motorists. * * *

In the first place, the life saving white line in the center of the highway attracts the eye. Then they have made safer many turns by widening the shoulders and they have smoothed the rough spots. * * *

Dangerous culvert edges have been marked with white posts, trees near the highway have been painted white and numerous stout barriers have been installed at danger points where they have long been needed.

It is very evident that they closely watch the highways and lose no time in doing all in their power to make the roads safer and some of the work done by them during the short time they have been in charge has been needed for a long period. They are always doing something to improve conditions and the roads taken over in many respects approach the main highway in condition and upkeep.

Numerous warning signs have been installed by the maintenance crews and if there is need for anything to be done to add to the safety of the motorists they do not overlook it. They are on the job all the time despite the vast district they must cover and only a perfect system could accomplish such results.—Art S. Newburgh in *Petaluma Argus-Courier.*

3400 Miles of Road to Link State and U. S. Forest Systems

OVER 3400 miles of roads in the National forests of California will eventually link the State highway systems to the mountain recreational areas, according to a report just made to the Department of Agriculture, Washington, D. C., by the U. S. Forest Service, Bureau of Public Roads and the State Highway Engineer.

Part of this proposed cooperative system consists of the Sierra Way, a high mountain road, already partly completed, paralleling the summit of the Sierra Nevada from Siskiyou County to Kern County. This highway links many of the outstanding scenic features of the State, such as Mt. Shasta, Mt. Lassen, Tahoe, the early mining country, giant trees and National parks.

The total estimated cost of the National forest highway system in California will be $127,383,700 of which $88,257,700 has been expended or allocated. Of this total the State share is approximately $50,000,000, the Federal government's $23,000,000 and the counties' $15,000,000.

Future expenditures of over $39,000,000 will be 55 per cent Federal, 35 per cent State and 10 per cent county funds.

AVERAGE SPEED ON MARYLAND HIGHWAYS 35.5 MILES AN HOUR

During the summer of 1933 the Maryland State Roads Commission carried on a highway traffic speed survey to obtain comprehensive knowledge of the way traffic actually uses the State highways. The speed of traffic was observed at about 50 of the regular traffic census stations which the State Roads Commission has used for many years. The results of the survey were reported by Dean A. N. Johnson of the University of Maryland at the 13th annual meeting of the Highway Research Board.

The average speed as observed from 41,000 vehicles was 35.5 miles per hour, with 87 per cent of all traffic within 45 miles per hour and 99 per cent within 55 miles per hour and only an occasional vehicle moving over 65 miles per hour.

The percentage of various rate of speeds is shown in the following table:

8 per cent between 15-25 miles per hour.
36 per cent between 25-35 miles per hour.
43 per cent between 35-45 miles per hour.
12 per cent between 45-55 miles per hour.
1 per cent between 55-65 miles per hour.

Farmer: "No, I wouldn't think o' chargin' ye for the cider. That'd be bootleggin'—an' praise the Lord, I ain't come t' that yit. The peck o' potatoes'll be five dollars."

Governor Praises Bay Bridge Chiefs on Completion of Deep Water Structures

COMPLETION of the twelve and one-half million dollar substructure of the San Francisco-Oakland Bay Bridge was celebrated with a great luncheon meeting of Oakland business men in the Hotel Oakland on Tuesday noon, October 16th, when Governor Frank F. Merriam gave public praise to State Director of Public Works Earl Lee Kelly and Chief Engineer C. H. Purcell, and their staffs, for conquering the deep waters of San Francisco Bay.

The luncheon was sponsored and managed by the Oakland Junior Chamber of Commerce, aided by the State Department of Public Works. Floyd J. Day was chairman of the Bridge Day for the Oakland Junior Chamber.

GREATEST IN WORLD

Governor Merriam pointed out that the underwater or unseen portions of the San Francisco-Oakland Bay Bridge alone, without considering its superstructure, made it the world's greatest bridge.

GOVERNOR MERRIAM examining model of flotation cylinder presented to him at luncheon given by the Oakland Junior Chamber of Commerce.

Fifty-one concrete piers, involving many different types of engineering design, one of which is original to this bridge, and which will be the State of California's contribution to subaqueous engineering, are now in the last stages of completion, with the deep water work all done.

Director of Public Works Kelly cited the faith which the contractors had in the designs of Chief Engineer Purcell and his staff, and pointed out that these great engineering and contracting firms and their bondsmen risked $12,500,000 on the judgment of the State of California's engineers.

SUBMARINE WORK FINISHED

Chief Engineer Purcell spoke briefly; thanked the contractors for their cooperation, and expressed pleasure that the deep water portion of the work was all done, and that the loss of life had been held to a record minimum of five men on the substructure work, one casualty having occurred on the substructure.

Consulting Engineer Charles Derleth, Jr., Dean of the University of California College of Engineering, offered his compliments to the State of California for the successful negotiation of the deep waters of the great San Francisco Bay.

Other speakers were: Floyd J. Day, general chairman; Lorenzo Buckley, chairman of speakers; Ed. H. Siems, vice chairman; W. J. McCracken, mayor of Oakland; Wm. Hamilton, chairman, board of supervisors.

The committee in charge of the event were: Floyd J. Day, Ed. H. Siems and Lorenzo Buckley.

Speaking at the luncheon, Chief Engineer C. H. Purcell assured football fans that they can count on crossing the great new bridge for the 1936 "big game."

Mr. Purcell announced that every department of the bridge construction is now well ahead of schedule and unless some unforeseen event transpired to hold up the work he estimated that the bridge will be completed sometime between the dates of August 15 and October 31, 1936.

"Say, why do you nickname your girl Appendix?"
"Because it costs so much to take her out."

155 Snowplows Ready to Keep State Highways Open Through Winter

By **T. H. DENNIS**, Maintenance Engineer

THE SNOWSTORM of September 23 was an early reminder to the public that the winter season is on the way. Many hunters and vacationists were marooned temporarily and were released by the Division of Highways' forces and snow removal equipment. The equipment was in operation a few hours after the start of the storm on Donner and Echo summits and around Lake Tahoe.

The Carson Pass, Ebbetts Pass, Luther Pass, Sonora Pass and Tioga Pass roads were closed for a day or so, but were opened easily as soon as equipment was available. The snowfall varied from 4 inches to 18 inches at various locations.

The Maintenance and Equipment departments had started the program for the 1934-1935 winter season long before. Detailed information as to equipment requirements had been collected and submitted for executive approval as early as July 27. Each season there are certain units of equipment which must be replaced either because of obsolescence or poor mechanical condition, and this year was no exception.

EQUIPMENT REPLACEMENTS

The new equipment and replacements are as follows:

New Equipment:
- 17 trucks from 2½ to 5-ton capacity
- 1 Auger type rotary
- 16 Speed type straight blade push plows
- 4 "V" type push plows

Units Retired:
- 14 trucks
- 4 30-h.p. tractors
- 4 tractor plows
- 2 tractor rotary plows
- 1 shovel type rotary plow
- 10 straight blade, "V" and speed type plows

While the new equipment represents an investment of about $100,000, there is an increase in inventory value of less than $4,000 due to the retirement of the old units.

Expenditures for snow removal work during the 1933-1934 season were $150,491.23 on about 2000 miles of road. The expenditure for the previous season was $304,259.18 on about 3300 miles of road.

Each community and individual feels that they are entitled to consideration in the snow removal program and, when the winter season starts in earnest, requests and petitions are received asking that particular sections of road be kept open. Usually such sections are in isolated areas of heavy snowfall and with very limited winter traffic at best. Naturally, the expense of keeping an open road is almost as great for a few as for a large number of machines, as a one-way road seldom will serve the purpose and drifts fill the road faster than when a two-way passage is provided.

PUBLIC MISUNDERSTANDS

It would be of some public benefit if all roads could be kept open the year around, but in many cases the extent of use would not justify the expense. Instances are on record where sections of road were opened with considerable difficulty in the spring, as a result of public importunity, on which the snow would have melted in the natural course of events in almost the same time and with very little aid from highway forces.

The public is slow to understand why the work of opening the mountain roads is delayed as long as possible each spring. After a certain time in the spring, the action of sun and wind with minimum assistance from highway forces will open up a road much faster and more economically than can be done earlier by strenuous efforts with heavy equipment.

There will be no particular increase in the sections of State highways for which snow removal work is planned for the coming winter over that carried out during the past two years. Last season, the light snowfall made it feasible to maintain an open road where that had not been possible before. Naturally, with a normal winter season it will not be practical to equal that situation entirely during 1934-1935 with the equipment and funds available.

THIRTEEN PERMANENT STATIONS

The snow removal work is now on a permanent, well organized basis. Permanent quarters designed for the needs of the work have been provided east of Emigrant Gap and at the Summit on the Donner Pass route; at

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HIGHWAY SNOW FIGHTERS in action—The top pictures show front and rear views of one of the large railroad type rotary plows. The operating end is at the rear of the machine which backs into the drifts. Lower left is a slice bar mounted on a truck. At right is a V-plow with side wing.

District Chiefs Men of Proven Ability

(Continued from page 4)

DISTRICT IV.

JNO. H. SKEGGS, with headquarters in San Francisco.

Just one month after his discharge from the army, where he had served in the Engineer's Corps with the rank of Lieutenant Colonel, on August 25, 1919, Colonel Skeggs was appointed to the position of Assistant District Engineer in District IV. Two years later, on the first of October, 1921, he received his appointment as District Engineer and has served the Division as chief executive of the San Francisco office for the past thirteen years.

DISTRICT V.

L. H. GIBSON, with headquarters at San Luis Obispo.

Mr. Gibson was helping to construct State roads in California before there was a Division of Highways. He was a "Road Engineer" with the old California State Engineering Department and was inducted into the Division on May 26, 1913, as Assistant Highway Engineer attached to the headquarters office. On the first of December, 1918, Mr. Gibson was appointed to his present position as District Engineer of District V.

DISTRICT VI.

R. M. GILLIS, with headquarters at Fresno.

Mr. Gillis is the youngest of District Engineers in the time of service to California, but his experience in highway construction has been broad and varied. Before coming to California as District Construction Engineer for District X in April, 1929, Mr. Gillis had served the Highway Department of the State of Washington on various phases of work, holding the position of District Engineer at the time he left that Department. Because of his wide experience he was made Assistant Construction Engineer for the California Division in August of 1929, supervising grading work over the State. On September 1, 1933, Mr. Gillis was promoted to District Engineer of District VI at Fresno.

DISTRICT VII.

S. V. CORTELYOU, with headquarters at Los Angeles.

Mr. Cortelyou, the dean of California's District Highway Enginers, with twenty-three years of service in the Division of Highways, is in charge of the most difficult District in the State. In his able administration of the affairs of his district he has justly earned the respect and esteem of not only his own community but of the entire State.

On February 1, 1912, Mr. Cortelyou was appointed to the position of Assistant District Engineer for District VII which post he held for nearly twelve years. On January 1, 1924, he was promoted to his present position. Mr. Cortelyou came to the State service from the office of the Los Angeles County Surveyor where he held the title of Office Engineer.

DISTRICT VIII.

E. Q. SULLIVAN, with headquarters at San Bernardino.

Mr. Sullivan began working for the Division of Highways as an Assistant Resident Engineer in District II in August, 1914, and served in that capacity and as a Resident Engineer until October, 1923, when he was appointed to his present position of District Engineer of District VIII. Prior to his State service, Mr. Sullivan was employed in Los Angeles as an inspector on construction for private consulting engineers.

DISTRICT IX.

S. W. LOWDEN, with headquarters at Bishop.

In April, 1912, Mr. Lowden joined the California highway organization as rodman on a survey party in District II, coming to the State service from the position of mine surveyor for the U. S. Government. Since that time he has climbed steadily in the organization having been a Resident Engineer, Superintendent of Construction, Maintenance Superintendent, and District Maintenance Engineer. On September 8, 1933, he was appointed to his present position as Acting District Engineer of District IX.

DISTRICT X.

R. E. PIERCE, with headquarters at Stockton.

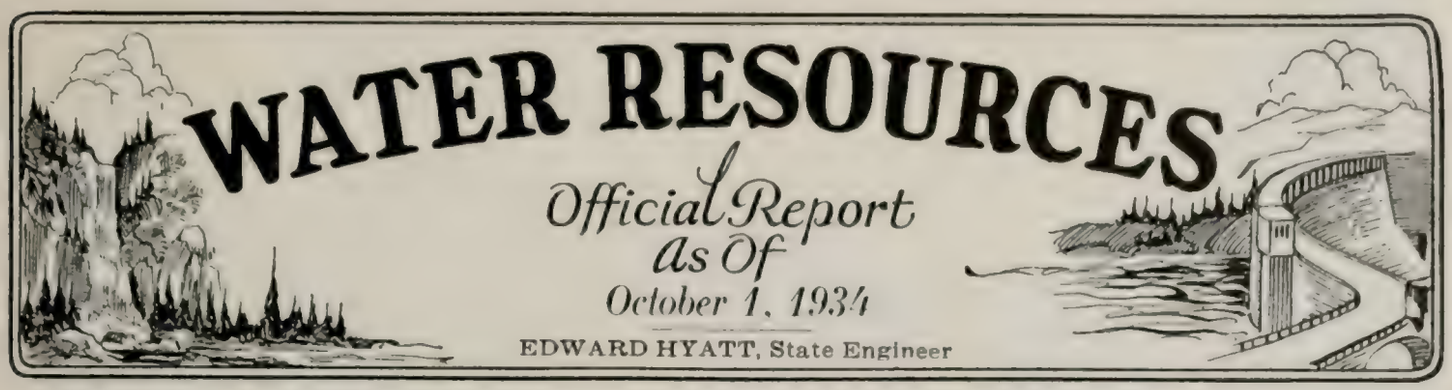
Mr. Pierce left the employ of the West Side Railroad Company as a Resident Engineer at Dixon to enter the Division of Highways organization as a draftsman in District III in June, 1915. A year and a half later he was made Office Engineer. In November, 1918, he took a leave for military service and returned a year later as Construction Engineer for the same District. With the formation of District X in 1924, Mr. Pierce was appointed to the position of Assistant District Engineer and on March 8, 1926, was appointed as District Engineer.

DISTRICT XI.

E. E. WALLACE, with headquarters at San Diego.

This District is the latest development in the growth of the Division of Highways and with its formation a year ago Mr. Wallace was entrusted with the organization, being transferred from his post as District Engineer of District VI, where he had been for over seven years. Mr. Wallace entered State employ as a draftsman in District V in 1913 where, in six years he climbed to the position of Assistant District Engineer, from which post he was transferred to District VI.

These are the men who labor devotedly for the development of the State highway system in the many sections of California and whose records of achievement will live long in the annals of road construction on the Pacific coast and of whose unselfish service all Californians should be justly proud.



A renewal of activities by irrigation districts for improvement of dwindling water supplies is reported by the California Districts Securities Commission. Applications for refinancing loans from RFC by a total of 26 districts up to October 1 had been approved by the Federal authorities.

Flood control and reclamation projects on the Sacramento, American, Feather and Mokelumne rivers are providing 56,316 man hours work. Flow of the Sacramento River at Sacramento has increased causing a recession of salinity at upper Delta stations.

Dam applications, topographic mapping and other activities of the division are covered in the monthly report of the State Engineer which follows:

IRRIGATION DISTRICTS

The State Engineer has been notified that the Hollister Irrigation District, San Benito County, which has been dormant since 1925, is reviving its organization, with the purpose of carrying out the necessary plans for developing a much needed water supply. The district contains highly developed orchard areas which are dependent on a rapidly diminishing underground water supply. An effective method of replenishing and augmenting this supply in time to prevent loss to much of the orchard area is the problem which demands the immediate attention of the district.

The South San Joaquin and Byron-Bethany Irrigation Districts in San Joaquin County have been notified that their applications for refinancing loans from RFC have been approved by the Federal authorities. The amounts involved in the loans are: South San Joaquin district, $2,652,500; and Byron-Bethany district, $372,500. The total number of California irrigation district applications to RFC for loans approved is 26.

FLOOD CONTROL AND RECLAMATION

a. Maintenance of Sacramento Flood Control Project.

During this period routine maintenance work has been carried on with a small force on the units of the flood control project.

b. Sacramento Flood Control Project.

The work of moving the Packer warehouse from the new levee right-of-way eight miles above Colusa has been commenced. This work is being done for the Reclamation Board, the estimated cost of which is $4,272. The new levee will be constructed by the California Debris Commission with State and Federal funds.

During this period this office has been directing the activities of several SERA projects sponsored by the State Reclamation Board. The work consists of clearing timber and brush from certain flood channels, and in most cases the lands are being grubbed so they may be farmed. In all cases tools and transportation are being furnished. The projects and the man-hours worked to date are as follows:

Federal Transient Service—Upper Sutter By-pass	4,530 man-hours
Federal Transient Service—Tisdale By-pass	564 man-hours
Federal Transient Service—Lower Sutter By-pass	6,060 man-hours
SERA Project No. 35-B14-27—American River	11,792 man-hours

Work was commenced on September 19th on SERA Project No. 58-B14-15, on the Feather River channel above Marysville, with a crew of 40 men. It is expected that this number will be gradually increased, the project including 29,000 man-hours. This office is providing tools and supervision, the men furnishing their own transportation.

Mokelumne River.

Work was commenced September 20th on SERA Project No. 35-B14-40, clearing and grubbing the by-pass channel between Reclamation District No 1002 and the McCormack-Williamson tract. The work started with a crew of 40 men, this office furnishing supervision and tools. There are included in the project 4370 man-hours.

WATER RIGHTS

Supervision of Appropriation of Water.

During the month of August, 41 applications were received, 17 were denied and 14 were approved. In the same period 3 permits were revoked and 3 passed to license.

Among the more important applications received were two by South Fork Irrigation District proposing appropriations from Mill Creek and Clear Lake, tributary to South Fork of Pit River, for irrigation and power uses in Modoc County.

Projects under permit were inspected preparatory to issuance of license in Nevada, Sierra, Butte, Yuba, Sutter, Yolo, Sacramento, San Joaquin and Contra Costa counties.

(Continued on page 30)

Planning to Protect Highway Trees from Methods of Butchers

(Continued from page 17)

whole crown shape is changed over a short period of from six to ten years, which calls for careful continued attentive work on the part of the trimmer.

There have been a few special instances that deserve mention, wherein private owners of trees although allowing a right of way have reserved the rights to care for the trees on the right of way. Usually these rights of ways are not the full 100 feet in width, and space is at a premium.

AN ALTERNATIVE LOCATION

If the property owner refuses the utility company the right to place poles upon land off the strip occupied by the highway and the trees, and if there is not sufficient room between the tree row and the property line for the pole line, then the poles and wires are placed between the shoulder edge and the tree row.

In some cases the poles have been leaned out away from the trees to afford more clearance. This type of pole placement is not encouraged if for no other reason than that the poles and wires rather than being obstructed by the tree row, tend to detract from the beauty of the trees by heir obviousness to the passing traveler.

There are a considerable number of trees along the highways that are now at the stage where the first trimming for wire clearance is necessary. If it is possible, and whenever the wires are at a reasonable or feasible distance from the trees, side trimming is resorted to in an effort to force the central leader growth up and to form a crown above the level of the wires. This will eventually give the same effect as that established on the large trees by the lowering of the wires to or under the crown growth.

SIDE-ARM PLAN

If the wires are not at a sufficient distance to one side to allow this trimming, a plan is under way wherein the wires may be side-armed on the poles until the crown is forced above the minimum wire height, at which time they may be replaced to their original position on the poles, with the same effect as produced on the trees as treated above.

There are existing rows of trees that have been planted directly underneath a line of wires, an evidence of very poor judgment in roadside designing. The only solution in such cases is to raise the wires to a maximum height and continually trim or move the poles a few feet in and side-arm if right of way width permits.

When planting new trees, the locations of poles and wires are now considered so that if trees can be well placed with regard to a beautiful effect and still not cause interference they are so planted.

GROUP PLANTING METHOD

More plantings of the group type are being made which does away with the long rows of trees in which every tree offers a problem of clearance, both to wires and to tree maintenance forces. These group plantings break up the monotonous view of poles and wires as effectively as a row planting would do, with none of the regimented stiffness afforded by the latter.

(Continued on page 26)

Grade Separation of Sunset and Glendale Avenues Completed

A NEW concrete viaduct carrying Sunset Boulevard across Glendale Boulevard in the heart of the city of Los Angeles was completed on October 1. This concrete structure has a 90-foot clear span across Glendale Boulevard and replaces a three-span timber trestle which had carried traffic for the past 29 years at this important grade separation.

Both Sunset and Glendale boulevards carry a tremendous volume of vehicular traffic and the Pacific Electric Railway has a double line of car tracks on both boulevards.

This is one of the projects financed from Federal highway funds set up for use within municipalities in 1933. The structure was designed in the office of the city engineer of Los Angeles. The contract was advertised and the construction supervised by the Bridge Department of the State highways.

TOTAL COST $142,000

The contract was awarded in the amount of $130,000 on January 9, 1934. In addition to the contract work it was necessary for the Pacific Electric to build falsework and do necessary track work in connection with taking care of the railroad during the construction of the grade separation. The work done by the railroad amounted to approximately $12,000, and this work was also financed with Federal highway funds.

The new structure provides a minimum 72-foot width of highway on Sunset Boulevard plus wide sidewalks. The width of roadway flares out over the structure to take care of the intersection with Reservoir Street at the northwest corner of the intersection.

FOUR-WAY INTERSECTION

Just north of the structure Lakeshore Avenue comes into Glendale Boulevard so that there are four different streets which come together at this intersection, which complicated both planning and construction.

It was found necessary to reroute the vehicular traffic but the project was carried to completion without interrupting the railway traffic, one line over the structure and the other on the street level under it. This was accomplished by constructing the arch one-half width at a time, building temporary trestle work and making three separate shifts of railway tracks and trolleys.

CARRYING THE HEAVY TRAFFIC of Sunset Boulevard over Glendale Boulevard in the city of Los Angeles this grade separation structure was recently completed. In addition to the large vehicular traffic two railway lines are accommodated, one running over the structure and the other beneath it.

RELIC OF EARLY CONSTRUCTION standards this old timber bridge has been replaced by the new concrete and steel viaduct. Besides being inadequate to carry the load of present day traffic, its heavy wooden supports obstructing the roadway were a menace to vehicles.

TRAFFIC AREA INCREASED by the single arch structure, there is now room for two lanes of traffic on either side of the railway tracks.

Realignment Eliminates 130 Curves

(Continued from page 12)

Assemblyman Clifford R. Kallam of Watsonville, former Mayor Fred W. Swanton, Postmaster Fred Hale, former Postmaster Fred R. Howe of Santa Cruz, Councilman Irving E. Mabie of Los Gatos, Sheriff A. T. Dresser, Supervisors George N. Ley and Rose Rostron, County Surveyor Lloyd Bowman and Resident Engineer F. C. Walsh, in charge of the project, also participated in the ceremonies.

Director Earl Lee Kelly in his dedicatory address pointed out that this nearly completed section of the Los Gatos-Santa Cruz highway serves only a part of the traffic problem through the Santa Cruz Mountains, and that several more similar projects will be required to bring the entire road to modern standard. If these needed projects are to be made possible, he stated, the highway funds of the State must be kept intact and preserved for highway uses.

The project dedicated is a section of State Highway Route No. 5 known as the Stockton-Oakland-Santa Cruz Highway. The Inspiration Point cut-off leaves the old road at a point nearly a mile east of Inspiration Point and with 6.67 miles of new construction, replaces eight miles of the most dangerous and difficult part of the old road, terminating at Scott's Valley.

The number of curves has been reduced by 130, to a total of only 22; 6101 degrees of curvature, or nearly the equivalent of 17 complete circles, have been eliminated. The minimum radius of curve is 500 feet as against 80 feet on the old road. The width of new road is a minimum of 46 feet through the mountainous section and 36 feet in the valley, or about 100 per cent greater than that of the old.

In relation to the present traffic, savings in operating costs alone derived from reduced travel distance, represent a profit of about 25 per cent as the yearly dividend on the money invested in the improvement.

If only a fourth of the motorists using this highway are concerned with distance saved the investment would still be justified on the mileage saving basis.

The traffic count has steadily mounted, being well sustained, even during these depression years, and often reaches peaks in excess of 12,000 cars per day.

The saving in travel distance is accompanied by a saving of from fifteen to twenty minutes in driving time. The increased driving comfort resulting from the elimination of curves will be a boon to the thousands of travelers who come not only from the nearby bay area, but from the Sacramento and San Joaquin valleys and other interior points to Santa Cruz beaches and mountain resorts.

In addition to the Inspiration Point cut-off, the section from Ocean Street in Santa Cruz for a distance of two miles toward Los Gatos has been completed. "Ultimately the entire 25-mile section between Los Gatos and Santa Cruz will have come under the reconstruction plan already well formulated, and in considerable measure brought to realization," Colonel Skeggs stated in a recent article.

On the evening preceding the dedication ceremonies, the State officials were guests of the Pajaro Valley Chamber of Commerce and after a brief inspection tour of the highway setup in that vicinity were entertained at a dinner in the Resetar Hotel at Watsonville. The local committee of arrangements included J. A. Harvey, chairman of the Monterey Bay Highway Commission, President W. W. Bendell of the Pajaro Valley Chamber of Commerce, F. L. Selleck, chairman of the chamber highway committee, and Secretary M. C. Hall.

PLANNING TO PROTECT HIGHWAY TREES FROM BUTCHERS

(Continued from page 24)

The policy of the Division of Highways is to secure whenever possible a 100-foot wide right of way. With this in mind no permits are issued to private parties to plant on less than an 80-foot right of way and the State planting program is governed by the same restriction.

Although the pole lines will be given preference under normal conditions, the time is coming when, if an issue of importance arises the wires and poles will come second to a well designed roadside. When necessary, the wires will cross the road through an underground conduit, to save a beautiful roadside vista, or when it is impossible to pass near a tree without spoiling the effect created by that tree.

While more intelligent handling of the problems as they arise has taken the place of the slipshod methods which were detrimental to all concerned, as time goes on these problems will cease to be considered as such and will become a part of the well accomplished routine of every day work.

Snow Removal Work Reduced by Drift Control Measures

(Continued from page 20)

Mineral and Lost Creek on the Susanville lateral; at Crestview, Conway Summit and Sonora Junction on the route between Bishop and Reno; and at five locations on the Crest route between San Bernardino and Big Bear Lake. At other locations, the regular maintenance stations are adequate to serve the purpose.

The equipment consists of some 155 snowplows ranging from the light motor grader "V" plows; straight blade plows for 2½ to 5-ton trucks; several "V" type plows attached to 5-ton 4-wheel drive trucks equipped with side wings and capable of bucking hard compacted drifts four feet in depth; auger type and railroad type rotaries with digger arms and back sloping blades, as well as rotary widening units.

The operations and equipment are varied to suit local conditions. On the Pacific Highway (U. S. 99) the snowfall is not heavy but there is considerable drifting. On the Susanville lateral the snowfall is fairly heavy but drifting is limited as the road is more protected from prevailing winds by the heavy stand of timber. On the road north of Bishop the snowfall is not extreme; however, there is a considerable mileage of road at an elevation of 8000 feet, where the snow is dry and drifts badly.

CONTROLLING THE DRIFTS

The snow removal work is reduced at certain points by drift control measures. In many cases, during construction provision is made to raise the grade of the road so that the fill portions will be kept clear by wind action. Likewise, the ditch sections and cuts are widened and the slopes flattened to provide storage space for snow.

In open areas, snow fence made up of lath pickets is installed on the windward side at a sufficient distance from the road to provide a windbreak and insure storing the snow before it reaches the road. There is now some 80,000 lineal feet of snow fence in place.

A safety measure carried out by highway forces is the sanding of icy sections of pavement to increase traction for equipment. Prior to the beginning of winter, sand mixed with salt is stockpiled in shelters at convenient locations and is applied with power spreaders as the need requires during the winter season. During the 1933-1934 season $14,780 was allocated for this purpose and about 1500 miles of road were so treated during the season.

HIGHWAY STRIPING BROUGHT TO HIGH DEGREE OF PERFECTION

Marching along beside the motorist on dark nights or in rainy or foggy weather when the best of headlights can pierce the murk only a few feet, those white traffic stripes on the highway win the heartfelt appreciation of anxious drivers. Modern practice in the striping of highways has resulted in making these safeguards one of the most indispensable features of safe motor travel.

State highway authorities in California can be credited with having brought highway striping to a high degree of perfection, constantly testing materials and methods to obtain the best and most lasting results. The distinctive center striping recently applied to the Bayshore Highway along the westerly side of San Francisco Bay was a further evidence of this policy.

On such heavily traveled four-lane highways, emphasizing the center line helps to prevent dangerous third lane driving, whether intentional or due to uncertainty as to location on the part of the driver.

Considerable attention is also being given to the value of striping the outer edges of highways in areas along the coast and other localities where dense fogs frequently reduce visibility almost to zero. Truly the motorist's friend, these reassuring white guide lines.—*Motorland.*

THREE MORE MILES GRADED ON SAN SIMEON-CARMEL COAST

Rapid progress is being made on projects along the Carmel-San Simeon highway in Monterey County.

Between Big Sur and 1.6 miles south of Molera's ranch, a distance of 3.1 miles, the highway has been constructed with a 24-foot graded roadbed. This project is through a very scenic portion of the Big Sur country; large redwood trees bordering the sides of the highway.

Between Monterey and the Seaside Road, a distance of 2.6 miles, fuel oil has been applied to the existing roadway shoulders; also on the road between Salinas and Castroville, a distance of 7.6 miles, and between Castroville and Watsonville, a distance of 11.3 miles.

Across Hot Springs Creek, 48 miles south of Monterey, a timber bridge, having a 24-foot roadway is under construction under the supervision of the Bridge Department and will be completed about the first of October.

County, State Share in Cost of $239,000 Short Cut Highway

(Continued from page 6)

of the route, would undoubtedly be too great for the thin oil surfacing which extends from Alameda Street easterly for 600 feet.

In order to bring this short section up to the standards of the pavement on either side, an extension has been made to the contract from Central Avenue to Alameda Street to include this portion and construct it to the same standards as the original contract. This extension to the contract is estimated to cost about $7,000, of which the county has agreed to contribute $3,000. Construction of this portion will be completed in October, 1934.

This will form a continuous full width improvement from Inglewood to Santa Fe Avenue at the west city limits of South Gate.

At present, the city of South Gate is improving Firestone Boulevard from Santa Fe Avenue to Atlantic Boulevard from the ¼ cent city gas tax fund, the State highway cooperative fund, and using SERA labor.

HIGH SPEED SHORT CUT

There is at present a wide pavement on this route from Atlantic Boulevard to Downey, and recently another State contract was awarded for 7.78 miles of new construction on a diagonal line along the Southern Pacific railroad from Downey to Buena Park in Orange County. This contract from Downey to Buena Park will be completed next spring, and eventually this highway will be extended to Miraflores to connect with the existing wide boulevard from that point to Santa Ana. The project as a whole will fill a need which has existed for many years for a high speed short cut from the territory along the southerly edge of Los Angeles into the heart of Orange County.

SURVEY BEING MADE ON THE COTTONWOOD PASS ROAD

A survey is under way for the reconstruction of the Cottonwood Pass Road from the Cholame lateral, near Cholame, to the San Luis Obispo County boundary, a distance of about 5½ miles. This is a portion of the route between Morro Bay and Fresno, which was included in the secondary roads taken over from the county on August 21, 1933, under an act of the Legislature.

Rattlesnake Creek Bridge a Structure of Unusual Design

THE new bridge across Rattlesnake Creek on the Redwood Highway in Mendocino County, forty miles north of Willits, recently completed and opened to traffic has some features of construction design that are new to this State.

The bridge is a unit of an improvement project by which the highway was given a much better grade and alignment.

The old section of road dropped down into a "V" shaped gorge and crossed the creek on a low, narrow bridge built about 1915. The road climbed out of the gorge on a vertical curve.

The new bridge has a 24-foot roadway, crosses the gorge 75 feet above the streambed and with its approaches makes the total project approximately three-quarters of a mile long. The 108-foot central span of the bridge is a three-hinged, framed arch of unusual design.

METAL RINGS USED

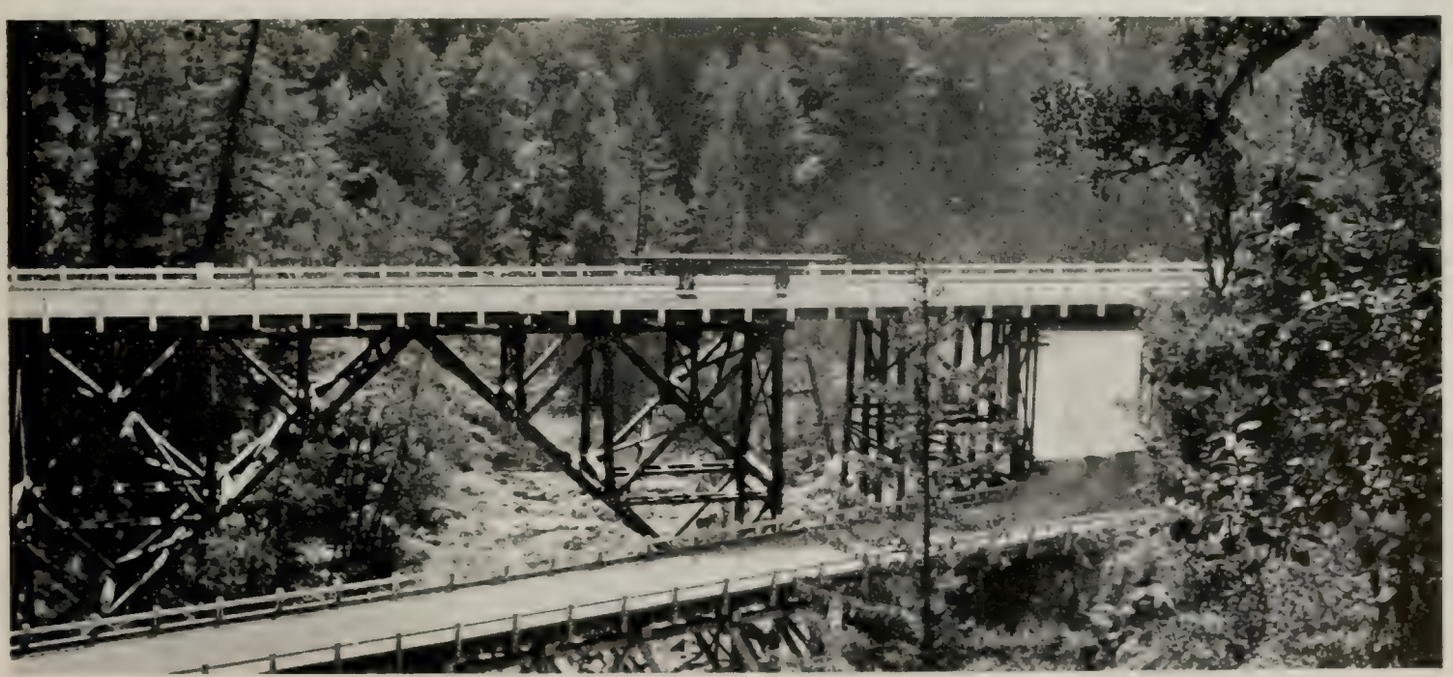
The ordinary framed structure of this kind would usually consist of large timbers butting against cast iron angle or bearing blocks, or by dapping the timbers when the member is in compression, and would have cumbersome bolted splices to take care of tension.

In this structure use is made of metal rings between several timbers composing the truss member which cause them all to act together and through these connectors the stresses are transferred from one member to another without the need of angle blocks, dapping or bolted splices. The rings are of two kinds—a split ring set into grooves which are cut into the adjacent timbers, and toothed rings which may be pressed into the timber.

The former are heavier and are used in the more important members. They have an advantage in permitting the use of smaller sized timbers, which are cheaper and less wasteful of our lumber resources for the reason that in cutting heavy timbers a large amount of smaller sticks must be cut which overstock the yards.

In erecting this structure, the contractor used a highline. One-half of a truss span was framed completely lying flat on the ground and then it was lifted into place by the highline.

NOVEL BRIDGE DESIGN is incorporated in this structure over Rattlesnake Creek on the Redwood Highway in Mendocino County. Metal ring connectors are used in the center span. Truss spans were framed on the ground and lifted into place by a high-line.



THE NEW AND OLD bridges are shown in this picture. The new crosses the creek 75 feet above stream-bed carrying the highway on a better grade and alignment and eliminating a vertical curve where the old road climbed out of the gorge.

CONSTRUCTION UNDER WAY ON THE COALINGA LATERAL

On the Coalinga lateral between the Mustang Ridge and Priest Valley in Monterey County, a distance of about 3.3 miles, the road is being constructed with a 24-foot graded roadbed and a 20-foot selected material surface. It is anticipated that this work will be completed in February of next year. This project is financed under the National Industrial Recovery Act.

One of the freshmen up at Ames can't understand why he has to take courses in husbandry in order to get his bachelor's degree.—*Earth Mover.*

Salinity Less at High Delta Stations

(Continued from page 23)

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Although during the past month the flow of the Sacramento River at Red Bluff has remained at the lowest summer levels, the flow at Sacramento has increased from 1000 to about 1500 second feet due to reduced irrigation diversions and increased return flow and rice drainage. There has been little increase in the flow of the San Joaquin River near Vernalis, the present flow being about 500 second feet.

The increased flow of the river at Sacramento has caused a recession in the salinity at the highest Sacramento Delta stations but at the lower stations and in the San Joaquin Delta there has been no recession and in many instances there has occurred a continued encroachment. The following tabulation compares the salinity at Bay and Delta stations on September 10, 1924, 1931, and 1934.

Comparison of Salinity at Bay and Delta Stations on September 1924, 1931 and 1934

	Salinity in parts of chlorine per 100,000		
Station	*1924*	*1931*	*1934*
Point Orient	----	1780	1760
Bullshead Point	----	1580	1640
Collinsville	1035	1180	1060
Emmaton	696	955	720
Rio Vista Bridge	402	640	490
Liberty Ferry	108	400	152
Isleton Bridge	30	440	35
Sutter Slough	7	12	8
Walnut Grove	8	10	8
Antioch	1065	1100	960
Jersey	604	800	620
Central Landing	164	250	78
Southwest Point	----	340	90
Ward Landing	----	330	190
King Island Pump	136	----	88
Rindge Pump	93	180	62
Orwood Bridge	----	230	84
Middle River P.O.	142	250	100
Clifton Court Ferry	60	100	34
Whitehall	----	23	9

DAMS

Applications were filed by the Santa Clara Valley Water Conservation District on August 20, 1934, for the construction of the following dams:

Coyote Dam, Santa Clara County on Coyote River; rockfill, 100 feet in height, storing 30,000 acre feet of water and to cost $340,000.

Calero Dam, Santa Clara County on Calero Creek; earthfill, 82 feet in height, storing 9000 acre feet of water and to cost $290,000.

Almaden Dam, Santa Clara County on Almaden Creek; rockfill, 100 feet in height, storing 2500 acre feet of water and to cost $210,000.

Guadalupe Dam, Santa Clara County on Gaudalupe Creek; rockfill, 115 feet in height, storing 3500 acre feet of water and to cost $260,000.

Vasona Percolating Dam, Santa Clara County on Los Gatos Creek; earthfill with Ambursen spillway section; 21 feet in height with a storage capacity of 660 acre feet and to cost $89,000.

Stevens Creek Dam, located on Stevens Creek; earthfill, 110 feet in height, storing 4000 acre feet of water and to cost $320,000.

Of the above dams the application for the Vasona Percolating Dam was approved on September 13, 1934.

Application for repair of the Antioch Dam in Contra Costa County was filed on September 11, 1934. This is a dam storing water for municipal purposes for the city of Antioch.

Application for repair of Quail Lake Dam was received on September 11, 1934. This dam is located on Quail Lake near Lake Tahoe and is used for domestic, irrigation and power purposes.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Topographic surveys are in progress on the Paynes Creek Quadrangle in Tehama County and the final sheets of Etna Quadrangle are now available. The latter quadrangle involves areas in Trinity and Siskiyou counties. It is mapped on a scale of 1:125,000 with a contour interval of 100 feet.

The final sheets of Joshua Quadrangle are now available. This area was mapped by the Geological Survey in cooperation with the county of Los Angeles. The scale is 1:24,000 and the contour interval is 5 feet.

WATER RESOURCES

a. South Coastal Basin Investigation

The principal activities this month in connection with South Coastal Basin investigation have been the completion of the report on geology.

b. Mojave River Investigation.

Field work on Mojave River investigation was begun in 1929 with funds appropriated by the Legislature of that year and continued during the biennium. In 1931 no appropriation for this work was made but by an agreement with agencies of the Federal government stream measurements and measurements of water levels at wells were continued together with work on loss of water from native vegetation and moist areas. Field work in this way on the stream measurements and well measurements has continued to the present date. During the month work was begun in the Los Angeles office on getting the report ready.

c. Central Valley Project.

Work on the Central Valley project has continued throughout the present month and additional data has been presented to the Federal Public Works Administration in connection with the application made by the Water Project Authority of California for a loan and grant for the construction of the project

First New State Route Number Sign Installed With Ceremony at Carmel

IN THE presence of a large gathering of State and local officials, civic and business leaders, and representatives of the California State Automobile Association, the first of the new State route number signs was installed on the afternoon of September 10 at Carmel.

Bearing the numeral 1, the sign was set in place at the junction of the Monterey, Pacific Grove and Carmel highways, a point on State Route No. 1.

This route, so designated in the new route numbering program, has the distinction of being one of the longest of the numbered highways, extending from Las Cruces north along the coast to Fortuna.

Under the initial program, two thousand miles of main traveled State highways will be posted with the new markers, requiring a total of more than six thousand signs, or an average of three to a mile.

In northern and central California the signs will be installed by the Automobile Association and in the south by the Automobile Club of Southern California under a cooperative arrangement with the Division of Highways. The work will be accelerated with completion of surveys.

Courtesy of Motorland.

FIRST IN THE FIELD of the new State route number signs, a number 1 marker was appropriately erected on State Route No. 1 at Carmel on September 10th with a gala ceremony attended by State and civic officials. Left to right in the above group are: Colonel Ralph Parker, commandant of the Monterey Presidio; Russell Bevans, State Registrar of Motor Vehicles; State Senator E. H. Tickle of Carmel; Supervisor Harry Abbott of Salinas and Percy E. Towne, a director of the California State Automobile Association.

Speakers at the Carmel installation ceremony stressed the magnitude of the plan and the high value of the new route number signs for visiting motor tourists or resident motorists traveling unfamiliar roads.

Percy E. Towne of San Francisco, a director and former president of the Automobile Association, reviewed the growth of California's official road signs and told of the difficulties that lack of dependable signs caused early motorists. Developed by the Automobile Association and Automobile Club of Southern California as official agencies and with the cooperation of State and local authorities, the sign system is recognized as a model by the Nation, Mr. Towne said.

The installation program was jointly arranged by the Monterey Chamber of Commerce, Pacific Grove Chamber of Commerce, Carmel Business Men's Association, and Monterey Peninsula Junior Chamber of Commerce.

Supervisor A. B. Jacobson of Monterey County was chairman of the arrangements committee. State Senator E. H. Tickle of Carmel officiated as master of ceremonies. Other members of the committee were E. J. Zanetta of Monterey; Sheldon Gilmer of Pacific Grove; E. A. H. Watson of Carmel; and K. Y. Sapero of Monterey.

Giving a gala touch to the ceremony, music was provided by the Monterey fire department orchestra in Spanish costumes, and the

(Continued on page 32)

Highway Bids and Contract Awards Made in September

BUTTE-PLUMAS COUNTIES—Oiling in various locations. Dist. II, Rt. 21, Secs. B-C-A-B. Tiffany Const. Co., San Jose, $4,368; C. F. Frederickson & Sons, Lower Lake, $4,418; Tieslau Bros., Berkeley, $4,519. Contract awarded to Hayward Building Material Co., Hayward, $3,864.

KERN COUNTY—Between westerly boundary and 2.4 miles south of Maricopa, 9.3 miles surfacing with bituminous material. Dist VI, Rt. 57, Sec. A. Western Motor Transfer Co., Santa Barbara, $51,160; L. A. Brisco, Arroyo Grande, $47,992; Hanrahan-Wilcox Corp., San Francisco, $49,575; Giffith Co., Los Angeles, $47,624; Stewart & Nuss, and John Jurkovich, Fresno, $45,854; Granite Const., Co., Ltd., Watsonville, $59,-458; Tiffany Const. Co., San Jose, $46,465. Contract awarded to C. W. Wood, Stockton, $42,579.

KERN COUNTY—Across Whiterock Creek at Monolith, a timber bridge of three 15-ft. spans. Dist VI, Rt. 58, Sec. F. Claude C. Wood, Stockton, $3,018; D. O. C. Const. Co., Santa Barbara, $3,199. Contract awarded to Rexroth & Rexroth, Bakersfield, $2,702.

KERN COUNTY—In Maricopa, 0.7 of a mile to be graded and surfaced with bituminous treated stone, Klipstein, Poso, California and Merced Streets. Dist. VI, Rts. 57 and 138. L. A. Brisco, Arroyo Grande, $14,962; John Jurkovich, Fresno, $12,463; Granite Const. Co., Watsonville, $13,081. Contract awarded to C. W. Wood, Stockton, $10,228.30.

LOS ANGELES COUNTY—Approaches to Alhambra Wash bridges about 0.3 of a mile long, to be graded and paved with asphalt concrete and two bridges to be constructed. Dist. VII, Rts. 26 and 168, Sections A, B. R. R. Bishop, Long Beach, $58,446; Griffith Co., Los Angeles, $59,389; Byerts & Dunn, Los Angeles, $61,417; Bannister Field Co., Ltd., and Fred E. Potts Co., Los Angeles, $63,710. Contract awarded to Kovacevich & Price, South Gate, $48,281.80.

MARIN COUNTY—Const. pile protection on bridge across Corte Madera Creek, at Greenbrae. Dist. IV, Rt. 1, Sec. C. M. B. McGowan, Inc., San Francisco, $10,500; Theodor Johannns, San Francisco, $7,490; Albert H. Seimer, San Anselmo, $8,246. Contract awarded to Healy-Tibbitts Const. Co., San Francisco, $6,832.

MERCED COUNTY—Across Santa Rita Slough, 0.5 of a mile graded, surfaced bituminous treated gravel, and a timber bridge. Dist. X, Rt. 32, Sec. C. Hanrahan-Wilcox Corp., San Francisco, $28,697; Poulos & McEwen, Sacramento, $30,285; C. W. Wood, Stockton, $21,641; Union Paving Co., San Francisco, $24,223; John S. Heilmann, San Francisco, $26,270; John Jurkovich, Fresno, $32,340. Contract awarded to Valley Paving & Const. Co., Fresno, $20,981.80.

MONO COUNTY—Grading, Drainage, and Surfacing with fuel oil 1.2 miles between Whiskey Canyon and Yerby's. Dist IX, Rt. 23, Sec. C. D. C. Follis, Glendale, $7,946; Basich Bros., Torrance, $7,230. Contract awarded to Hemstreet & Bell, Marysville, $6,862.

RIVERSIDE COUNTY—Between 1½ miles north of Moreno and 2½ miles west of Beaumont about 6.8 miles to be graded, surfaced oil treated crushed gravel. Dist. VIII, Rt. 19, Sec. D. Griffith Co., Los Angeles, $364,-469; Sharp & Fellows Const. Co., Los Angeles, $372,-772; Granfield, Farrar and Carlin, San Francisco, $380,627; J. F. Knapp, Oakland, $419,604; Hanrahan-Wilcox Corp., San Francisco, $479,705; United Concrete Pipe Corp., Los Angeles, $448,983; Daley Corp., San Diego, $447,090; C. O. Sparks, Sander Pearson & Mundo Engr. Co., Los Angeles, $478,998; Jahn & Bressi, Los Angeles, $389,418; Oswald Bros., Los Angeles, $389,430; C. W. Wood, Stockton, $390,220; Basich Bros., Torrance, $474,739. Contract awarded to Mittry Bros. Const. Co., Los Angeles, $360,809.90.

SAN BERNARDINO COUNTY—Through Bloomington, about 0.4 mile to be graded, paved with Portland cement concrete. Dist. VIII, Rt. 26, Sec. D. C. O. Sparks, Los Angeles, $25,614; B. G. Carroll, San Diego, $27,973; Matich Bros., Elsinore, $29,108; George Herz & Co., San Bernardino, $31,565. Contract awarded to Griffith Co., Los Angeles, $24,954.20.

SAN DIEGO COUNTY—In San Diego, between Market St. and Broadway, 0.3 of a mile grading and paving with asphalt concrete. Dist. XI, Rt. 2, Sec. SD. Griffith Co., Los Angeles, $24,114; V. R. Dennis Const. Co., San Diego, $23,933. Contract awarded to Daley Corp., San Diego, $23,415.70.

SANTA BARBARA COUNTY—Between Hollister Ave. and Painted Cave Road, 5.8 miles to be oil treated and a bridge to be constructed across San Antonio Creek. Dist. V, Rt. 80, Sec. C. Sharp & Fellows Contracting Co., Los Angeles, $494,555; C. W. Wood, Stockton, $412,363; Jahn & Bressi Const. Co., Los Angeles, $371,482; Peninsula Paving Co., San Francisco, $493,009; A. Teichert & Son, Sacramento, $444,-219. Contract awarded to Granfield, Farrar & Carlin, San Francisco, $368,268.35.

$50,000 LEFT TO BEAUTIFY ROADS PROVES WIDOW'S MITE

Six years ago Mrs. Mary Hyland, a widow, of San Francisco had accumulated a fortune estimated at about $50,000 by traveling about California selling pencils. In her daily pilgrimages she often sought in vain for a shady place to rest so she bequeathed her fortune to the State in a trust to extend over a period of fifty years "for the purpose of beautifying the highways by planting trees and constructing benches at a distance of about a mile apart, such trees to be fruit trees whenever deemed advisable."

But misfortune came and under date of September 18, the State was informed by the Wells Fargo Bank and Union Trust Company, executor and trustee, that Mrs. Hyland had died leaving a balance of 69 cents to her account and $42 found in her purse.

STATE ROUTE NUMBER SIGN INSTALLED AT CARMEL

(Continued from page 31)

Eleventh Cavalry Band from the Monterey Presidio.

The preliminary work of logging the roads and making surveys of intersections to determine the number and location of signs for each of the 198 selected routes, is proceeding with all possible speed.

It is estimated that from three to five signs per mile will be necessary. On this basis it is planned to have approximately ten thousand signs erected by the first of next year. In the meantime additional signs and material for their erection will be secured.

The number of signs needed at intersections varies with the number of roads or streets leading into an intersection and with traffic conditions.

A study of all principal intersections is being made by the engineers of the State Maintenance Department to collect the necessary data for locating the signs. This study is being conducted first in the large metropolitan areas.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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JOHN W. HOWE, Secretary

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F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
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C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

CALIFORNIA STATE PRINTING OFFICE
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SACRAMENTO, 1934

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

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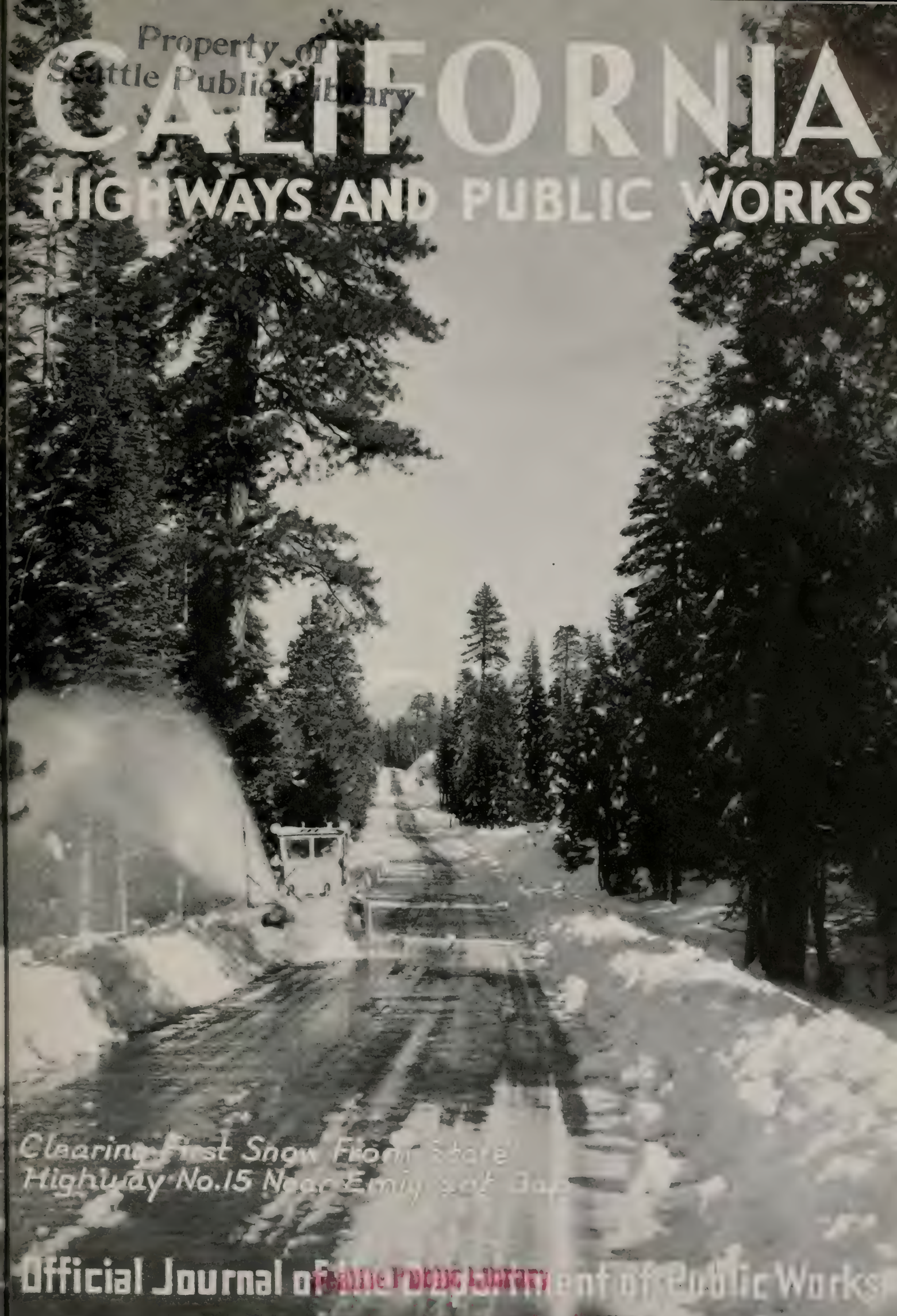
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Clearing First Snow From State
Highway No.15 Near Emigrant Gap

Seattle Public Library

Official Journal of the Department of Public Works

NOV.-DEC. 19=

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Highways Stand to Lose Millions of Available Funds by Gas Tax Diversion

Director Kelly Warns Against Consequences of Proposed Legislation that Will Cause Serious Financial Losses, Curtailing Construction and Increasing Unemployment

By **EARL LEE KELLY**, Director of Public Works

FACED with the necessity of finding some solution for the State's pressing financial problems, the next Legislature will be confronted with bills aiming to divert gas tax revenues to other than highway purposes, despite the fact that in a like situation two years ago, during the Legislature's interim vacation, the people of the State turned down such a proposition by an overwhelming referendum vote.

As the State officer charged with the duty of maintaining and improving our fine road system, I feel it incumbent upon me to call attention to the highway situation and the consequences of any diversion of revenues that would disrupt our present pay-as-you-go plan of self-liquidating highway investment — a plan that has operated so successfully in extending the economic and recreational advantages of our own citizens while constituting a very large and increasing financial asset to the whole State as a tourist attraction that brings millions of dollars annually to California trade channels.

EARL LEE KELLY

In presenting this picture I must first call attention to the human factor involved because I consider it of paramount importance in this critical period through which we are passing when our State and nation are bending every effort to give jobs and pay rolls to a vast army of unemployed.

It is generally conceded and affirmed by the United States Bureau of Roads that no form of unemployment relief is so effective as highway work in its wide spread of pay roll benefits and returns in value received from the capital investment. The State gasoline tax revenues are today providing jobs for thousands of California citizens, including part-time emergency relief workers, all heads of families supporting some 12,000 dependents who would otherwise be on community charity rolls.

With the present highway financial set-up left undisturbed, available revenues from the gas tax, motor vehicle fees, and Federal funds already allotted to California, assure 12,900,000 man-days work on highway construction and maintenance during the next three years.

U. S. OPPOSES DIVERSION

But, if the next Legislature should divert any gas tax moneys from highway purposes, the Federal government has issued the warn-

(Continued on page 12)

DEC 10 1934

Governor Merriam Dedicates Link of Tahoe-Ukiah Lateral in Snow Storm

STANDING bareheaded in a driving snowstorm that raged over the Donner Summit area of the high Sierras on Sunday, November 18, Governor Frank F. Merriam officially opened the last completed sector linking the Tahoe-Ukiah lateral (State Route 15) with State Route 37, the Auburn-Truckee portion of U. S. 40, the Victory Highway.

The dedicatory ceremonies were held near the intersection about 3 miles east of Emigrant Gap where a caravan of some sixty automobiles from Grass Valley and Nevada City deposited State and civic officials, committeemen and enthusiastic celebrants in several feet of snow.

Borrowing a pair of rubbers and with his bare head partly shielded by an umbrella held by Deputy Director of Public Works Edward Neron, Governor Merriam made an address dedicating the highway. Calling it the most unique celebration in which he had ever participated, Governor Merriam said:

PIONEER SPIRIT SHOWN

"This route is along the trail laboriously traveled to the Golden State by the covered wagons before this highway was dreamed of and we should feel proud that we have the same pioneer spirit left which will bring us here when the elements are against us."

Regarding the storm conditions, Jack Wolff, Chairman of the Arrangements Committee, wrote to the Nevada City Nugget as follows:

"It was an exhibition of real sportsmanship for Governor Merriam, Deputy Director Neron (Department of Public Works), various State and county officials and visitors from Nevada City, Grass Valley, and points as far away as Mendocino County, Sacramento, San Francisco, and southern California, to brave a storm of blizzard proportions."

After the ceremonies a number of the cars were caught on the floor of Bear Valley in a blinding flurry of sleet and snow that obliterated the two-way lane previously made by three snow plows. Many not equipped with tire chains were unable to climb the grade out of Bear Valley and the State highway snow plows were engaged until long after darkness pulling them out and pushing them over the grade.

Opening the Highway

In the wilds of the high Sierras,
  Far from the rain-drenched town,
They opened the Tahoe-Ukiah
  As the snow came drifting down;
And every man was a booster,
  For the knocker is out of luck
When lending a hand to a strenuous task
  That calls for decision and pluck.

They opened the Tahoe-Ukiah
  In a blizzard of snow and rain,
But with spirits all undaunted
  They will trend that way again;
For visions of snow-clad mountains
  And great trees swathed in white
Will alluringly call and beckon,
  "Come back to the ranges of light."

In the wilds of the great Sierras,
  In the teeth of an icy gale,
They opened the new made highway
  On the old Ukiah trail;
And perchance a delegation
  From a land beyond our ken
Watched as they bucked the snowdrifts,
  And shouted, "Good work, my men!"

So here's to O'Brien, the dreamer,
  Our Governor and the rest,
Who opened the Tahoe-Ukiah
  With the spirit that conquered the West;
Who taught us that fine achievement
  And romance are born anew
When the patience and faith of the dreamer
  Are linked wih the will to do.

—A. Merriam Conner in Nevada City Nugget.

SIXTEEN YEARS TO COMPLETE

Other speakers at the dedication were: James K. O'Brien of Smartville, Yuba County, the master of ceremonies; Edward J. Neron, Deputy Director of Public Works; Arthur B. Foote of Grass Valley, and George L. Jones of Nevada City.

O'Brien, who was introduced as the father of the Tahoe-Ukiah Highway project, said that although he was the first president of

(Continued on page 25)

STORM KING GREETS ROAD DEDICATORS—At top is a view of the recently completed link of the Tahoe-Ukiah lateral near its intersection with State Route 37 (U. S. 40) at Emigrant Gap. A portion of Lake Spaulding is seen at the right. The dedication scene in the midst of a snow storm is shown in the center with an inset of Governor Merriam and Deputy Director of Public Works Edward Neron. Below is the group at the barrier with Chairman James K. O'Brien standing next to Governor Merriam.

74,450 Pounds of Explosives Fired in Kings River Canyon Highway Blast

By **L. D. PACKARD**, Resident Engineer.

IN WHAT is believed to be the most rugged section of the Sierras of California there is being constructed the Kings River Highway. Designated as State Highway Route 41, it begins at the northerly boundary of General Grant National Park in Fresno County and proceeds in an easterly direction to Cooper Creek, about 38 miles distant, on the South Fork of the Kings River.

Owing to the large percentage of solid rock encountered, the use of explosives is a major part of the construction operations, and without them the construction of this highway would be an almost impossible task.

About eighteen miles east of General Grant Park the South Fork of the river makes a sharp turn to the north, which is known as Horseshoe Bend. A short distance upstream a rugged point of solid rock juts over the river, around which the highway passes about three hundred feet above the stream bed. Owing to the hardness of the rock and the prohibitive cost of drilling, if down holes were employed, and the great amount of yardage involved it was decided the best and most economical method would be to move the entire point with one blast.

COYOTE TUNNEL DRIVEN

A tunnel, generally designated as a "coyote," was driven along the gutter line as shown on the accompanying map. To facilitate the boring of this tunnel it was opened by the use of adits at three places, this permitting the employment of five and sometimes six drilling crews simultaneously. During construction the material removed from the tunnel was wheeled out in wheelbarrows and wasted from the above mentioned adits. From the main tunnel short stub tunnels were drilled where needed, to provide pockets for the proper distribution of the dynamite. In all a total of 745 feet of tunnel was driven.

The drilling was done with jackhammers equipped with "wet heads" and attached to a tunnel bar to give them stability. Water for the "wet heads" was provided by a 5000-foot gravity pipe line from Redwood Creek, and air was supplied by a battery of three portable compressors, of rated capacities of 310, 310 and 460 C.F.M. of free air, hooked up to operate as a single unit.

The actual air delivered at this elevation (3300 ft.) was 855 C.F.M. The compressed air was delivered to the point of use through 4000 feet of light-weight spiral welded 4-inch pipe, and in order to reach all points, where work was being conducted, it was necessary to lay this line over a ridge about 400 feet above the grade of the highway.

A 37 TON SHOT

The bulk of the explosives was placed in the pockets of the tunnel as indicated on the map. It will be seen that a portion of it was used in the "gopher" holes and lifters that were drilled at grade along the wide portion of the point. A total of 74,450 pounds of powder was used. Of this amount 4000 pounds was 40 per cent nitro and the balance No. 40 "free flowing."

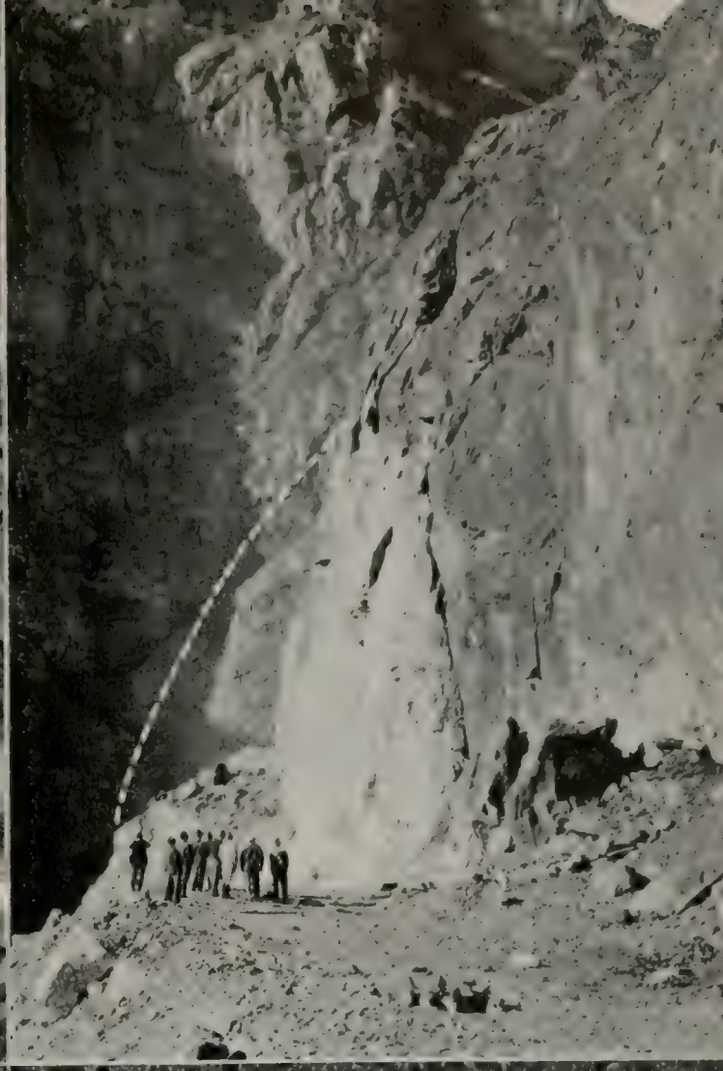
The nitro was in stick form of 1″ x 8″ dimension and the "free flowing" came in 12.5 pound bags. There are four bags to each box, making a total of 1489 boxes for the entire "shot." The 40 per cent nitro was used for primers. About 25 pounds was placed in contact with the cap at each pocket to insure the balance of the powder being ignited. Number 8 electric blasting caps were used and were connected with 14 gauge, insulated copper wire.

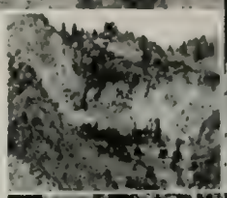
To minimize the possibility of any "missed" pockets that might occur from "shorts" in the wiring or other means, a duplicate system of ignition was employed by using Cordeau, a detonating fuse consisting of a lead tube filled with trinitrotoluene (T.N.T.) of an outside diameter of 0.23 inch. The Cordeau was ignited by an electric cap attached to the wiring for the pockets.

PACKED WITH GRANITE

After the powder had been placed in the pockets it was packed in with decomposed granite and the remainder of the tunnel was backfilled with earth and rocks, carefully placed, to provide a tight "plug" so that the full effect of the powder would be obtained when the gases formed by its ignition ex-

(Continued on page 24)





A MOUNTAIN RENT ASUNDER by the explosion of 75,450 pounds of dynamite was the spectacle beheld by a party of engineers in the Kings River canyon when the big blast moved 50,000 cubic yards of rock barring the progress of the Kings River Highway. Left upper photo shows the mountain spur and pioneer road before the blast and at right is seen the result of the blast. Below are shown a portion of the completed highway and the billowing smoke clouds that filled the canyon.

Santa Barbara Celebrates Opening of $700,000 Through Traffic Boulevard

By **L. H. GIBSON**, District Engineer

GRADUALLY through the past few years a serious traffic problem has developed in the city of Santa Barbara. This has been brought about not only because of increased motor registration in Santa Barbara itself but also because of the great increase in volume of traffic passing through the city, which is on the main highway between Los Angeles and San Francisco via the Coast Route. This route, U. S. 101, is particularly popular throughout the year because of its scenic attractiveness, and in addition, the immensely fertile vegetable growing areas along the coast have created a large trucking business between the two metropolitan cities of the State.

It has heretofore been necessary for traffic passing through Santa Barbara to traverse streets that are almost entirely residential in character, and the rumbling of heavy trucks day and night has brought much complaint to the city officials. The only remedy to eliminate traffic congestion and to take the truck noises away from the harassed residents was to develop an entirely new highway through the Channel City.

Construction of the Santa Barbara through traffic boulevard, which has been under way since last winter, has been completed and a celebration officially opening the new boulevard to traffic was held in November.

The route of the boulevard lies largely over new right of way. It makes possible easy and rapid passage of traffic over smoothly paved wide streets through the city and at the same time it passes very close to the center of the business district.

This is in keeping with the general policy of passing through traffic through a city with the minimum of congestion to local traffic, particularly in the business district. The portion through the city occupies land that is not generally heavily built up, making the cost of right of way relatively low.

Portions of the boulevard along Gutierrez and Milpas streets, which are heavily built up on both sides of the streets, were not included in this construction. The improvement of this remaining section is a matter involving cooperation between the State and the city and the allocation of revenues which may become available in the future.

ANOTHER BARRIER FALLS as Chairman Harry A. Hopkins of the California Highway Commission severs a silken ribbon stretched across the Montecito Overhead Bridge on the new through traffic boulevard just completed in the city of Santa Barbara. Shirley and Patricia Rogers, two dainty little maids dressed in Spanish costume assist in the ribbon cutting ceremony. At left of Mr. Hopkins is Commissioner F. A. Tetley and at right, Mayor H. T. Nielson of Santa Barbara.

(Continued on page 28)

THROUGH TRAFFIC BOULEVARD recently completed in the city of Santa Barbara is a 3-lane, asphalt concrete highway 5.9 miles relieving the city's congested district of much heavy Coast Route traffic. The upper picture shows a section extending from Carillo Boulevard near the easterly city limits. The Mission Creek bridge sector is seen in the center photo and below a portion of the westerly unit leading to the intersection with the Coast route at Central Avenue.

States' Highway Officials in Convention Urge Many Constructive Policies

Chairman Harry A. Hopkins of the California Highway Commission represented this State at the recent annual convention of the American Association of State Highway Officials as a member of the important administration and resolutions committees. The recommendations of the convention are accepted as the voice of highway officialdom in State, Federal and congressional circles. Mr. Hopkins describes the proceedings in the following article:

By **HARRY A. HOPKINS,** Chairman California Highway Commission

THE TWENTIETH annual meeting of the American Association of State Highway Officials was held in the West November 12–15, in the picturesque and oldest city in the United States, Santa Fe, New Mexico, referred to as "The End of the Santa Fe Trail." Forty-five out of the 49 States, counting Hawaii, were represented.

President D. S. Warden, chairman of the Montana Highway Commission, opened the session. So many very fine papers and talks were given it will be impossible to cover them in detail. The address of welcome was made by Governor A. W. Hockenhull of New Mexico. The sessions were held in the State Capitol Building with the State Highway Department of New Mexico acting as host to the convention.

HARRY A. HOPKINS

The opening address before the general assembly was given by Thomas A. MacDonald, chief of the bureau of Public Roads, United States Department of Agriculture, Washington, D. C. Mr. MacDonald gave a report of the activities carried on by the U. S. Bureau of Roads particularly in relation to the carrying out of the National Industrial Recovery Act and the results of the States' application to highway projects of money received from the Federal appropriations.

Another outstanding paper before the general assembly was given by Col. A. B. Barbour, of the United States Chamber of Commerce, entitled "The Great Need for Uniformity in Highway Traffic Laws." He stated that uniformity in traffic laws could not be expected to originate in the National government, but should be accomplished through legislation by the States. One point he stressed was that the lack of data from the States made it hard to give authentic statistics covering the many ideas in connection with this subject.

From his investigations he did determine that the accidents in the United States per year reached a figure between one and a half and two and a half billion dollars and equaled the automobile output in this country. He stated that most of the accidents were on rural roads and that those States

Inter-American Highways Approved

(Continued from preceding page)

that had driver license laws had 30 per cent less accidents.

The slowness with which the several States are adopting the new code of uniform vehicle laws presented by the association is preventing the benefits that would follow to the traveling public. At the present time these codes have been adopted by Delaware, Pennsylvania and California only. Where States have adopted a standard license system they show 32 per cent more efficiency. Accidents are resulting in a greater toll than any other causes and the reduction of accidents will depend upon the will of the authorities and the people.

The group meetings throughout the period of the convention discussed administrative problems, covering future Federal and State policy in the construction of feeder and local roads. Feeder roads provide for the movement of considerable truck traffic leading to markets and necessarily add to the traffic on our main arterials.

Another subject concerning local education for the need of by-passing cities was opened up by A. W. Brandt, Director of Public Works, State of New York. The result of this discussion was a renewal of unanimous sentiment that through traffic is the main consideration of the State. Much criticism directed to State highway departments for going around cities or away from the congested areas is brought about by the use of the word by-pass. If the term alternate route were used instead, many smaller cities might view this necessity in a more favorable manner.

For the legal topics group a paper was prepared by C. C. Carleton, chief of the Division of Contracts and Rights of Way of the State of California, on zoning for control of building along the highways. Due to Mr. Carleton's absence Charles Ross of North Carolina presented this paper. It was considered one of the outstanding papers of the convention and the many quotations from court decisions and the statutes of the different States indicated that the States can feel safe in greater activity in this connection.

STANDARD SIGNS ADVOCATED

Traffic control and safety was the subject covered by E. W. James of the U. S. Bureau of Roads in which he stressed the point that the States should adhere to standard signs.

Other subjects in group meetings covered were Uniform Accounting, Bridges and Structures, Materials and Research, Road Design, Road Construction, Maintenance and Roadside Planning and Development, Committee on Roadside Planting and Development, and Cooperation with Contractors.

The executive secretary's annual report covered so much statistical information shown by tabulations, it is impossible to give the details in this article. It was shown, however, that during the past calendar year the States' system mileage was increased in the United States by 10,007 miles. This added mileage was principally in California, Kentucky, Minnesota, Utah and New Jersey. However, one outstanding point brought out was that the increase is but 40 per cent of the increase reported a year ago.

The total mileage on the States' systems the first of this year was 382,668 miles. Only 32 per cent of this is paved and is a gain of only 2 per cent over the year previous. Another point brought out in the secretary's report is that of the $112,000,000 diverted from highway use in 1933 more than 1/3 of the entire amount was made by the State of New York, and 87 per cent of the remainder came from nine other States. Twenty-one States made no diversion whatever and the tendency indicated less diversion for 1934.

The resolutions committee was very active throughout the convention and just before adjournment presented 15 resolutions, which were adopted by the association. The points stressed in each one of these are as follows:

FIFTEEN RESOLUTIONS PASSED

NO. 1. The association expressed its appreciation of the assistance supplied by National enactment with executive approval and the association pledged continued allegiance and support in directing rapid expenditure of all road funds now available or that may be provided through legislative procedure.

NO. 2. The association expressed its approval of legislation of the second session of the 73d Congress which assured a three year dependable road program. It is a desirable situation when the States are advised in advance what the government intends to do and the knowledge of predetermined revenue and preconstruction engineering give assurance of successful planning and construction of our highways.

GAS TAX DIVERSION

NO. 3. The last session of Congress provided that any State that diverted gasoline taxes after June, 1934, up to June, 1935, in a larger amount than had been diverted before the passing of the act shall loose 1/3 of the Federal aid coming to that State. The association reaffirmed its position heretofore taken that all motor highway vehicle fuel tax revenues and all motor license and motor registration fees should be spent under the supervision of the State upon a properly selected system of roads and that any other use of these funds may easily undermine an important National enterprise. The association approves of the restricted legislation and after the States have had sufficient time to rectify existent diversion that the Federal government should then extend the penalty to include all diversion from road purposes of these motor revenues whatsoever.

U. S. NUMBERED ROUTES

NO. 4. The association approved the action of the executive committee in consolidating U. S. numbered routes wherever possible, thus simplifying the same, and only adding mileage to the system through unoccupied territory. The executive committee should continue its studies in consolidating routes, coordinating mileage and carrying out the original intent of the U. S. numbered system by causing numbers of routes to follow in sequence and extend in easterly, westerly, northerly, and southerly directions. Routes that are supposed to run in one direction in many

(Continued on page 19)

California's Experience in Regulating Advertising Signs Along Highways

By **J. M. CALL**, Outdoor Advertising Assistant

THE ENACTMENT of the California Outdoor Advertising Act, which became effective August 21, 1933, marked the goal of many years of study and effort on the part of various organizations interested in the protection of scenic attractions of the highways. The passage of this legislation encountered serious difficulties.

The courts would not uphold legislation based upon aesthetic principles alone; therefore, the fact that regulation of outdoor advertising would greatly reduce traffic hazards became a major factor in favor of the measure. In addition to legal difficulties, organized opposition of advertising concerns presented a problem which required patience and perseverance to overcome.

These major obstacles having been met and the law passed, Earl Lee Kelly, Director of the Department of Public Works, in whom was vested the authority to enforce the act, authorized the formulation of an enforcement program. In a short time it was apparent that the difficulties encountered prior to the enactment of the law were no greater than those presented in the enforcement.

MAJORITY COMPLIED

Provision was made that no actual enforcement should take place until six months after the law was in effect. This period was given over to educating the public at large, as well as those actually engaged in the business, in order that they would be advised as to their liability under the act and arrange to comply.

The larger advertisers and organized advertising concerns complied in most instances without question. This was undoubtedly due to the fact that they appreciated the necessity of such a control measure, knowing well that the elimination of dilapidated, unsightly displays would enhance the value of well-kept, legalized advertising.

Some operators protested on the ground that the act violated both State and Federal constitutions.

Although the law provides that evidence of a property owner's consent to the placing of a display upon his property must be submitted by an applicant for a display permit in order to protect the property owner, and incidentally assist the enforcement of the trespass law, property owners have repeatedly protested the people's right to preserve the scenic value of the highways.

CONSTITUTIONALITY CHALLENGED

Upon the expiration of the six months grace period, a suit was filed by an outdoor advertising company, attacking the constitutionality of the act. A restrainer was granted preventing the State from removing and destroying any of the plaintiff's displays. This company had complied with the licensing provision of the act, but stated in their suit that enforcement of the permit provisions allowed double taxation and property removal without observance of due process of law.

Pending a court decision, it was deemed unjust to enforce any of the violation provisions. The decision was rendered in due time. A demurrer filed by the Attorney General in answer to the suit was sustained without leave to the plaintiff to amend and the restraining order was dissolved. Advice was received that the plaintiff would appeal but that nothing prevented administering any section of the act. At the direction of Director Kelly, plans long contemplated were put into effect and actual enforcement was begun.

FEES REVENUE INADEQUATE

While it was the intent that this function of government should be self-sustaining, it was early seen that the fees for permits were inadequate. The clerical work involved in granting permits is undoubtedly far in excess of what the legislators believed it would be, when permit fees were fixed.

As an example: a display owner requests an application by mail; having obtained it, in many instances another letter is received asking instructions as to how to prepare it. This done, the application is received and, even if properly prepared, a sign fee is enclosed rather than a structure fee, or vice versa. More correspondence finally results in the applicant obtaining the permit, at a cost to the State of possibly 50 per cent in excess of the permit fee.

(Continued on page 14)

REMOVAL OF SIGNS that violate the law is proceeding under the Outdoor Advertising act. Upper picture shows a sign illegally placed within 300 feet of an intersection. In the lower picture a sign is being removed for which no permit has been secured and fee paid.

STORAGE PILES ARE GROWING—Structures removed are carefully stored in various highway maintenance yards awaiting reclamation by owners.

Gas Tax Diversion Means Many Jobless

(Continued from page 1)

ing that such diversion will cost California the loss of a large part of the Federal aid allotment for the next biennium. The Federal government issued this warning because it has observed the dire results of gas tax diversion by other States. Hence, to protect the government's investment of many millions of dollars in State highways the last session of Congress enacted in the Hayden-Cartwright Act, the following provision of law.

> "Sec. 12. Since it is unfair and unjust to tax motor-vehicle transportation unless the proceeds of such taxation are applied to the construction, improvement, or maintenance of highways, after June 30, 1935, Federal aid for highway construction shall be extended only to those States that use AT LEAST THE AMOUNTS NOW PROVIDED BY LAW FOR SUCH PURPOSES in each State from State motor vehicle registration fees, licenses, gasoline taxes, and other special taxes on motor-vehicle owners and operators of all kinds for the construction, improvement, and maintenance of highways and administrative expenses in connection therewith, including the retirement of bonds for the payment of which such revenues have been pledged, AND FOR NO OTHER PURPOSES, under such regulations as the Secretary of Agriculture shall promulgate from time to time: Provided, That in no case shall the provisions of this section operate to deprive any State of more than one-third of the amount to which that State would be entitled under any apportionment hereafter made, for the fiscal year for which the apportionment is made."

It is to be noted that the law reads: "**at least the amounts now provided by law.**"

We have received requests for and have furnished to the Secretary of Agriculture a full file of the present State enactments determining the distribution and use of gas taxes, motor vehicle fees and revenues designed for highway purposes. Under the regulations promulgated by him, any diversion or redistribution reducing the amount available for highway purposes as now established by law would immediately incur the loss of one-third of the Federal aid appropriation made by Congress in the Hayden-Cartwright Act for the two fiscal years 1936 and 1937.

MEANS 3,000,000 LOSS

Approximately $3,000,000 of Federal aid would be lost and this together with the amount of the diversion from State funds would provide jobs for thousands of men. It is a heavy price to pay for diversion—doubly heavy when it is realized that the taxpayer must eventually provide even a greater amount to take its place in supporting those so thrown out of employment.

The loss of this amount of Federal aid money alone would mean a reduction of 8½ per cent of the estimated State highway revenues available for construction for the 1935-1937 biennium.

Such reductions in State highway revenue present a most serious aspect, and will if put into effect undoubtedly result in large economic loss to the State, seriously impairing the vital facilities in which the State and traveling public have invested over $300,000,000.

EVERY DOLLAR NEEDED

I want to firmly impress upon the minds of our legislators and citizens that every available road dollar is needed and can be put to work at once. There is no such thing as an idle highway surplus lying around awaiting necessary projects to which it can legally be applied, and there never can be for the next ten years at least. There are always more projects demanding attention than there are funds to pay for them.

For example, when the current biennial budget was being prepared projects totaling more than $90,000,000 were urged upon the Highway Commission by civic and official delegations from all parts of the State, and the available funds for construction of projects amounted to only $34,000,000.

The Commission is now preparing a budget for the next biennium, beginning July 1, 1935, and projects totaling many millions in excess of the estimated available funds have been urged for inclusion.

Many of these proposed projects are worthy and necessary improvements that must eventually be made for the proper development of our highway system to meet the demands of an ever increasing traffic, and contribute to the economic development of fast growing sections of the State, and every dollar spent on such improvements is a profit paying dollar returning daily dividends to the motorist in savings on mileage, fuel and upkeep costs, time and energy.

Every Road Dollar Needed to Finance Project Demands

(Continued from preceding page)

More than 6000 miles of county roads were taken into the State system by the last Legislature. A large amount of construction, reconstruction, betterment and maintenance with numerous bridge replacements are necessary to bring these roads up to the standards adequate to properly serve traffic, and no additional revenues have been provided for this work; rather the State highway revenues have been reduced.

Failure to keep roads up to adequate standards works a double injury to the State; first, in depreciation on investment, and second, in loss of revenues from gasoline consumption. States that have diverted gas tax funds have found that vehicular use of their roads has decreased.

Even the most elementary economic consideration leads to the conclusion that the State must protect the large investment it now has in its present State highway system. Maintenance of the roads alone will not offer this protection. It requires in addition a certain amount of reconstruction and rebuilding where the original old roads have failed and where maintenance would be entirely inadequate to restore the facilities and most certainly uneconomical to attempt to keep them serviceable for traffic.

DOUBLE TAXATION UNFAIR

The road user pays the bill for an improvement which is a benefit to the State as a whole. He is doing this without complaint because he receives adequate compensation for his contribution to which he is certainly entitled. Discussing this phase of the question an eminent authority says:

"Motorists are primarily citizens and taxpayers, they pay property taxes, income taxes, ad valorem taxes, poll taxes, school taxes, water taxes and other levies. As motorists, they pay special additional taxes, such as a gasoline tax for a specific purpose: roads. Is it fair to tax the motorist as a citizen to meet the general expenses of government, then to tax him to build roads, and then, instead of building the roads, to use the money for such general purposes as pensions, salaries, State buildings, State prisons, libraries, fire houses, unemployment relief doles, etc.?"

Is it giving the motorist a fair deal to subject him to this double taxation and then cheat him out of the promised benefits?

The fine citizens of this great Commonwealth of California answered that question with an emphatic "NO" when it was put to them in the referendum two years ago and there is no reason to believe they have changed their minds.

APPRECIATION EXPRESSED FOR HIGHWAY IMPROVEMENT

Gridley Community Club, Gridley, California.
Mr. T. H. Dennis,
State Highway Maintenance Engineer,
Sacramento, California.

Dear Sir: The Gridley Community Club wishes to express its sincere appreciation of the splendid work of improvement and conditioning of State Highway 99-E being carried out in this district under the supervision of your district superintendent, Mr. C. H. Bohrmann.

We wish to commend Mr. Bohrmann for his excellent and diligent service and also desire that the State Highway Department be informed that we realize the value and importance of the general and local program of the highway department as an aid to motor traffic, a contribution to progress and also as to pay roll and other factors.

We offer the cooperation of the Gridley Community Club in any matter it may be of service to the State Highway Department or to Mr. Bohrmann.

Yours very truly,

GRIDLEY COMMUNITY CLUB.
(Signed) L. G. Van Tongeren, President.

KINSMAN BACK AT WORK AFTER CAR FIRE ACCIDENT

J. K. Kinsman, assistant equipment engineer at the Headquarters Shop in Sacramento, has returned to work after six weeks' stay in a hospital as the result of an accident while he was driving from San Francisco to Sacramento on October 3d.

When near Dixon the car caught fire and before Mr. Kinsman was aware of what had happened he found himself enveloped in flames. Only his presence of mind in opening the car door and hurling himself out into the roadway saved his life. He rolled in the ditch, putting out the flames that were burning his clothing, but his arms and legs were seriously burned. Other motorists came to his assistance, rushed him to Dixon for first aid treatment, and he was then removed to a hospital at Sacramento where he was confined until November 14th, suffering from second and third degree burns.

His many friends will rejoice to know that he has made a fine recovery and is able to return to his duties.

Sign Enforcement Act Covers 76,000 Miles of Highways

(Continued from page 10)

In the issuance of but one or two sign permits, the fee for which is 25 cents each per calendar year, the cost to the State always exceeds the cost to the permittee.

It must be understood that very little reliable data were available at the outset, relative to the actual number of displays that come within the purview of the act, which exercises no control over advertising within the corporate limits of any city, county, or town. Such study as was given the revenue provisions must have been based on the number of displays in the more thickly populated unincorporated areas, since the only survey on record covered but 2582 miles of public highways.

ORIGINAL SURVEY MISLEADING

This survey also showed that 60 per cent of the displays viewed were located upon the property upon which the goods or merchandise advertised was for sale. This circumstance, as will be shown later, is of vital importance. If a true proportion were maintained, that is, number of signs increased in direct proportion to the increase in mileage, the revenue would probably be sufficient to finance enforcement. Unfortunately, however, approximately 90 per cent of the advertising is located within view of less than 20 per cent of the total mileage.

It follows, then, that some 76,000 miles of highways must be traversed in order to effectively enforce the act with regard to not more than 4000 advertising structures and signs.

The enforcement program, therefore, was put into effect in the areas with the largest number of signs. Thus the main arteries of traffic were first surveyed. The law provides that 10 days written notice be given **THE OWNER OF THE PROPERTY** upon which a nonconforming display is located prior to the entry of the maintenance forces to effect the removal and destruction of a cited structure. In order to avoid confusion, the owner of the display is also accorded this formality, since it is his obligation to rectify the violation should he elect to do so. If no action is taken to legalize the maintenance of the display within the 10 days following receipt of the citation, the maintenance forces are instructed to remove it.

OWNERS MAY REPOSSESS

This enforcement procedure is in line with section 17 of the act, which provides that nonconforming displays shall be **REMOVED AND DESTROYED.** Temporarily, the displays are being dismantled and stored at the various maintenance yards and the owners may repossess them within 90 days upon payment of all costs incidental to their removal upon presentation at the maintenance yard of their validated copies of applications for a permit to place and maintain them in accordance with the act.

Absence of a permit plate upon a structure or sign constitutes a violation. No structure or sign may be placed unless a permit has first been obtained in accordance with the act. To date, repossession requests have been so few as to ren-

(Continued on page 26)

State Road Damaged by Farm Machines Paying No Gas Tax

DAMAGE to highway surfaces by operation of agricultural machines equipped with field grousers in certain localities is a very difficult matter to combat due to the indifference or acquiescence of the local people.

A case in point occurred on July 16 and 17 when a tractor towing a harvester was operated over the pavement in the vicinity of Esparto in Yolo County. The tractor had sharp grousers without street plates, and the harvester had two sharp flanges on each wheel.

LARGE AREA DAMAGED

As shown by the photographs reproduced on the adjoining page, the caterpillar tracks pulled out some of the asphaltic concrete surface and the harvester wheels cut into the pavement from $\frac{1}{2}''$ to $\frac{3}{4}''$ deep, breaking a layer of the asphalt as thick as the depth of the cut. Damage was particularly severe on the armor top type of surface. The thin coat of bituminous surfacing was broken entirely from the base.

The district attorney's office swore out a warrant for the arrest of the operator of the equipment. A jury trial was held at Capay on September 25, and the defendant was acquitted.

When it is considered that the fuel burned in farm tractors and harvesters is exempt from the gas tax and consequently that such equipment operated on State highways produces no revenue to repair the damage, the following comparison showing total highway expenditures by the State in Yolo county as against income accrued in the county should prove food for thought:

Expenditures from State highway and Federal funds from July 1, 1933, to June 30, 1934		$382,676 26
County's proportion of receipts from motor bus and truck tax, gasoline tax and license fees expended on county roads		86,192 93
Total		$468,869 19
Receipts from motor bus and truck tax, gas tax and license fees—		
State (based on county allocation)	$158,277 12	
County	86,192 93	
		244,470 05
Excess expenditure		$213,399 14

RAVAGES OF A TRACTOR. Upper left—Route 50 between Madison and Brooks, Yolo County. Caterpillar tractor and flanged heavy wheels have torn out and loosened edge of oil mixed pavement. Upper right—Route 50, between Madison and Brooks showing deep cut caused by flange of heavy wheel in bituminous macadam pavement. Lower left—Route 50, between Madison and Brooks where tractor and harvester pulled diagonally across at railroad crossing West of Capay leaving ravelled out track about 14 inches wide. Lower right—Route 50, Yolo County, armor type or bituminous pavement between Brooks and Codannassa approximately 1½ inches thick where sharp flange of harvester wheel cut off edge of pavement.

U. S. and Western State Engineers Hold Conference on Road Building Material

By **THOMAS E. STANTON, JR.**, Materials and Research Engineer

ONE of the most important conferences relating to road building materials was held at the Materials and Research Laboratory of the California Division of Highways on November 7th and 8th when over one hundred representatives from the eleven Western State Highway Departments, the U. S. Bureau of Public Roads, the Asphalt Association and California Division of High ways, gathered to discuss the standardization of specifications for the road oils and cutback asphalts used in low cost bituminous surfacing construction.

The meeting was the fourth of a series of meetings started at the instigation of the U. S. Bureau of Public Roads and the Asphalt Association in February, 1931. Two of the three previous meetings were held in Salt Lake City, Utah, as being more centrally located for the States concerned and one meeting was held in San Francisco in January, 1932.

The meeting just concluded was one of this series of regional meetings through which agreement has been reached covering a number of points, with the result that specifications for bituminous materials have been simplified and the products standardized to such an extent as to reduce the cost to the producer and to the consumer.

IN SUBSTANTIAL AGREEMENT

Previous meetings were directed primarily at securing as great a degree of acceptance on the part of the different States as possible, of the new specifications recommended by the Bureau of Public Roads and the Asphalt Institute. The last meeting was for the purpose of considering such revisions as experience has shown to be desirable and was under the direction of the States participating in the conference as distinguished from previous meetings conducted under the direction of the Bureau of Public Roads and the Asphalt Institute.

The meeting developed the fact that except for a few minor differences, all the Western States are in substantial agreement, and that the program decided upon at previous conferences is proving generally satisfactory.

Additional lines of study directed towards further improvements were discussed and an investigational program agreed upon which it is expected will develop information making it possible to still further improve specifications and methods of use of the materials under discussion.

A dinner meeting, presided over by C. S. Pope, Construction Engineer of the California Division of Highways, was held at the Senator Hotel, Wednesday night, November 7th, at which C. H. Purcell, State Highway Engineer of California, addressed the delegates.

The sessions of the conference were attended by six representatives from the U. S. Bureau of Public Roads, twelve State representatives from the Western States outside of California, twenty-three representatives of the Asphalt Institute and other asphalt and road oil producers, and seventy-one from the California Division of Highways. Following is a complete list of those in attendance:

BUREAU OF PUBLIC ROADS

A. H. Benedict, Materials and Oiling Engineer, District 1, Oregon; K. S. Chamberlain, Materials Engineer, District 12, Utah; B. W. Matteson, Regional Office, B.P.R., California; J. T. Pauls, U. S. Senior Highway Engineer, Washington, D. C.; Roderic Pearson, Materials Engineer, California; Worth D. Ross, Materials Engineer, Colorado.

WESTERN STATES GROUP

J. W. Powers, Engineer of Materials, Arizona; Thos. E. Stanton, Jr., Materials and Research Engineer, California; K. C. Vail, Materials Engineer, and John P. Donovan, Maintenance Engineer of Colorado; Arthur C. Waller, Materials Engineer, Idaho; Seward Mason, Testing Engineer, Montana; L. W. Little, Assistant Testing Engineer, and F. H. Morrison, Testing Engineer of Nevada; N. M. Finkbiner, Engineer of Materials, Oregon; Levi Muir, Materials Engineer, Utah; Jack Davis, Constructing Engineer, and Bailey Tremper, Materials Engineer of Washington; I. E. Russell, Materials Engineer, Wyoming.

(Continued on page 28)

ENGINEERING EXECUTIVES of the United States Bureau of Public Roads and of the eleven Western States in attendance at the meeting shown in the above group are: Bottom row, left to right, Seward Mason, Materials Engineer, Montana; B. W. Matteson, Reg. Office B.P.R., San Francisco; A. H. Benedict, Materials Engineer, Dist. 1, B.P.R., Oregon; Thos. E. Stanton, Jr., Materials and Research Engineer, California, and Levi Muir, J. W. Powers, I. E. Russell, L. W. Little, Materials Engineers, respectively, of Utah, Arizona, Wyoming and Nevada.

Top row, left to right, J. T. Pauls, Senior Highway Engineer, B.P.R., Washington; K. S. Chamberlain, Materials Engineer, District 12, B.P.R., Utah; John P. Donovan, Maintenance Engineer, Colorado; Worth D. Ross, Materials Engineer, B.P.R., Colorado; K. C. Vail, Materials Engineer, Colorado; A. C. Waller, Materials Engineer, Idaho; N. M. Finkbiner, Materials Engineer, Oregon; F. H. Morrison, Materials Engineer, Nevada.

CALIFORNIA STATE MAINTENANCE ENGINEERS—Back row, left to right—J. F. Taylor, Assistant District Maintenance Engineer, District I; C. E. Bovey, District Maintenance Engineer, District X; J. E. Stanton, District Maintenance Engineer, District VIII; R. L. Thomas, District Maintenance Engineer, District I; L. E. McDougal, District Maintenance Engineer, District V; E. E. Sorenson, District Maintenance Engineer, District XI. Front row, left to right, E. Evens, District Maintenance Engineer, District VI; R. P. Duffy, District Maintenance Engineer, District IV; M. Fosgate, District Maintenance Engineer, District I; W. A. Smith, Assistant Maintenance Engineer, Central Office; G. F. Helleson, Assistant Maintenance Engineer, Central Office; I. S. Voorhees, District Maintenance Engineer, District VII.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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SQUARE DEAL IN HIGHWAYS

MOTORISTS traveling over the highways of Alpine County must admit that the smallest county within California is getting a square deal from the Highway Commission of that State.

Mountain passes in Alpine County are primarily tourists highways and can not be classed as all-the-year roads. For four or five months of the year the three interstate highways, including the Kit Carson route, the Grass Lake road to Lake Tahoe and Ebbett's Pass, are closed to traffic by winter storms. However, during the summer months, these Sierra routes open up one of the most desirable vacation centers in the entire west. Marvelous vistas of mountain scenery, lakes and streams, flanked with green meadows, are all that anyone could wish for.

The amount of taxable property within Alpine County could not possibly stand the burden of highway construction. However, the officials of California rightfully recognize that in contributing money with which to build mountain highways, they are opening up vast regions for vacation purposes and adding to the stability of the more sparsely settled districts.

At this time some $250,000 is being expended in construction of a standard highway from Markleeville to Centerville, a distance of six miles. Flanking the Carson River the route is no less scenic than that of the Truckee River Canyon. To observe power shovels and other heavy equipment tearing through mountains to straighten the highway is to realize to just what ends engineers will go to give motorists perfect roads through the Sierras.—*Gardnerville (Nevada) Record-Courier.*

Federal Road Building In Last Fiscal Year Exceeded all Records

THE road construction supervised by the Bureau of Public Roads in the fiscal year ending June 30, 1934, far exceeded the construction in any previous year, states Thos. H. MacDonald, chief of that bureau of the U. S. Department of Agriculture, in his annual report.

"This increase was due primarily to grants for road construction under the National Industrial Recovery Act," says the report. "The roads built have been sections of the Federal aid highway system, extensions of the system into and through cities, important secondary or feeder roads, and sections of main highway through the National forests, parks, and public lands."

PEAK EMPLOYMENT IN JUNE

The peak in employment with 336,414 at work on Federal and Federal aid highway construction came in June, 1934, when the new public works program was well advanced. This figure represents direct employment on the roads only and does not include the indirect employment, conservatively estimated at 1.4 times the direct, provided in the production and transportation of materials and equipment used in road construction.

The report shows that Federal and Federal aid construction employment supervised by the Bureau of Public Roads has constituted an increasing proportion of Federal and State highway employment. Federal work was a fourth of the program in 1932 and nearly one-half in 1934.

14,780 MILES COMPLETED

Public works highway funds assigned to the various States amounted to $394,000,000.

A total of 14,780 miles of Federal aid roads was completed in the year, bringing the total mileage completed since 1916 to 119,712 more than half of the Federal aid system designated. The active public works highway program for the fiscal year 1934 totaled 22,378 miles. By the end of June, 6986 miles were completed, 13,674 miles were in various stages of construction, and 1718 miles were approved for construction.

"Jack was the goal of my ambition," she sighed, "but alas!"

"What happened, dear?"

"Father kicked the goal."—*Boston Evening Transcript.*

Property of Seattle Public Library

Diesel Fuel Tax Reform Advocated

(Continued from page 9)

cases make abrupt turns and run for several hundred miles in a direction that does not indicate the number it should follow.

INTER-AMERICAN HIGHWAYS

NO. 5. The Congress of the United States in 1930 provided funds for a survey of inter-American highways. The survey has been completed between the Canal Zone and the United States border at Laredo, Texas. The 73d Congress made further appropriations for continuing reconnaissance and instrument surveys as well as undertaking construction in cooperation with countries through which these surveys have been made. The association expresses its support of this action in the interests of trade and amicable relations with these countries. It was recommended that funds be made available for an extension of reconnaissance southward from the United States border and from Panama into South America. If the Congress would act on this suggestion it would mean three or four inter-American highways.

MOTOR VEHICLE ADMINISTRATION

NO. 6. Provision was made that a committee of three members of the American Association of State Highway Officials be appointed to work continuously with the corresponding committee of the American Association of Motor Vehicle Administration.

TRAFFIC CONTROL DEVICES

NO. 7. The association has adopted the revised manual on highway traffic controlled devices and the same is being printed for the use of State highway departments. It is urged that all the States adopt this manual as the standard for all traffic control, signs, signals, markings and other control devices therein presented and to cause the actual installation of such standards by a process of replacement as quickly as possible. This is a forward movement in the interests of highway users and should be received with the greatest favor.

FEDERAL AID MILEAGE

NO. 8. The Federal government, through an act passed June 18, 1934, provided that any State may expend not to exceed 1½ per cent of its Federal aid allotment for advanced planning. This referred to additional mileage beyond the 7 per cent eligible to receive Federal aid funds. The selection of such additional mileage should cover an intense and intelligent study. It is urged that the State highway departments devote a liberal part of the permissible funds to traffic study and that the U. S. Bureau of Roads be requested to enter into an agreement to conduct surveys that will disclose roads not now in the Federal aid system that should next be added and further data adequate to make a complete classification of all public roads.

California has completed its Federal aid system and we should know at the earliest possible moment that this is recognized by the U. S. Bureau, because it will be necessary to have additional Federal aid mileage on which to apply our portion of the Federal aid money appropriated for the years 1936 and 1937.

RAILROAD GRADE CROSSINGS

NO. 9. Because of the financial condition of the railroads the Federal government has signified an intention to provide money for elemination of railroad grade crossings and the association is in accord with this move. There is not only a necessity for railroad elimination, but also elimination of highway intersections and the construction of bridges. The loss of life on both types of crossings is tremendous and the association assures the Congress that any appropriation of public works money for the purposes mentioned will be a contribution to the public safety and the general welfare of the Nation.

California has better than 15,000 railroad grade crossings and if all of them were eliminated it would cost about half of what has been mentioned as an appropriation from Congress for the whole country.

SECONDARY OR FEEDER ROADS

NO. 10. In view of the Federal government having appropriated funds for the improvement of secondary or feeder roads not necessarily included in the States' systems or the Federal aid system of highways, the association recognizes that such road work coordinates with our primary highways and has increased employment through the expenditures of funds on such roads. Continuing this policy such feeder roads would adequately connect with shipping points of the Federal system and the association feels that it is highly desirable to expend on secondary or feeder roads through the facilities of the members of the association appropriations of public works money, and the association would offer all the facilities of the States in cooperation that such plan could be carried out.

AGGREGATES INDUSTRY CODE

NO. 11. Contractors of highways who produce their own aggregates for their own use and not for commercial purposes should not come within the purview of Code 109 of the crushed stone, sand or gravel, and slag industries. The association feels that they should come under the regulations of the Secretary of Agriculture through the U. S. Bureau of Roads and divorced from the conditions controlling sand, gravel and broken stone for commercial purposes.

FORTY-HOUR WEEK

NO. 12. Contractors working under the National Recovery Act and controlled by a maximum of 30 hours a week for common labor on out-door work find that these conditions place an unnecessary burden on them due to loss of time and a continuous shifting of forces. They also find that the 30-hour week does not provide on the present wage scale, especially due to loss of time, an adequate compensation for common labor. The regulations covering the classification of labor are that skilled and intermediate classes of labor must come from the county within which the project is located.

The association feels that 40 hours should be the maximum hours per week covering contracts on highway work and that skilled and intermediate labor should be secured from any place within the State.

(Continued on page 22)

Foothill Boulevard Cutoff Relieves Traffic Congestion in San Fernando

By **S. V. CORTELYOU,** District Engineer

WITH the completion on October 31st of the cutoff between Olive View and Tunnel Station in Los Angeles County, the Foothill Boulevard route from Pasadena, which has formerly connected with the main central California highway between Los Angeles and Sacramento at San Fernando, is extended from the end of Foothill Boulevard in a diagonal line to connect with the main route at Tunnel Station.

Connection between Foothill Boulevard and the main highway (San Fernando Road) was formerly made via Roxford Avenue, which joins San Fernando Road at one of the busiest intersections in San Fernando. This cutoff has the important effect of eliminating the congested traffic district through the city of San Fernando from this route.

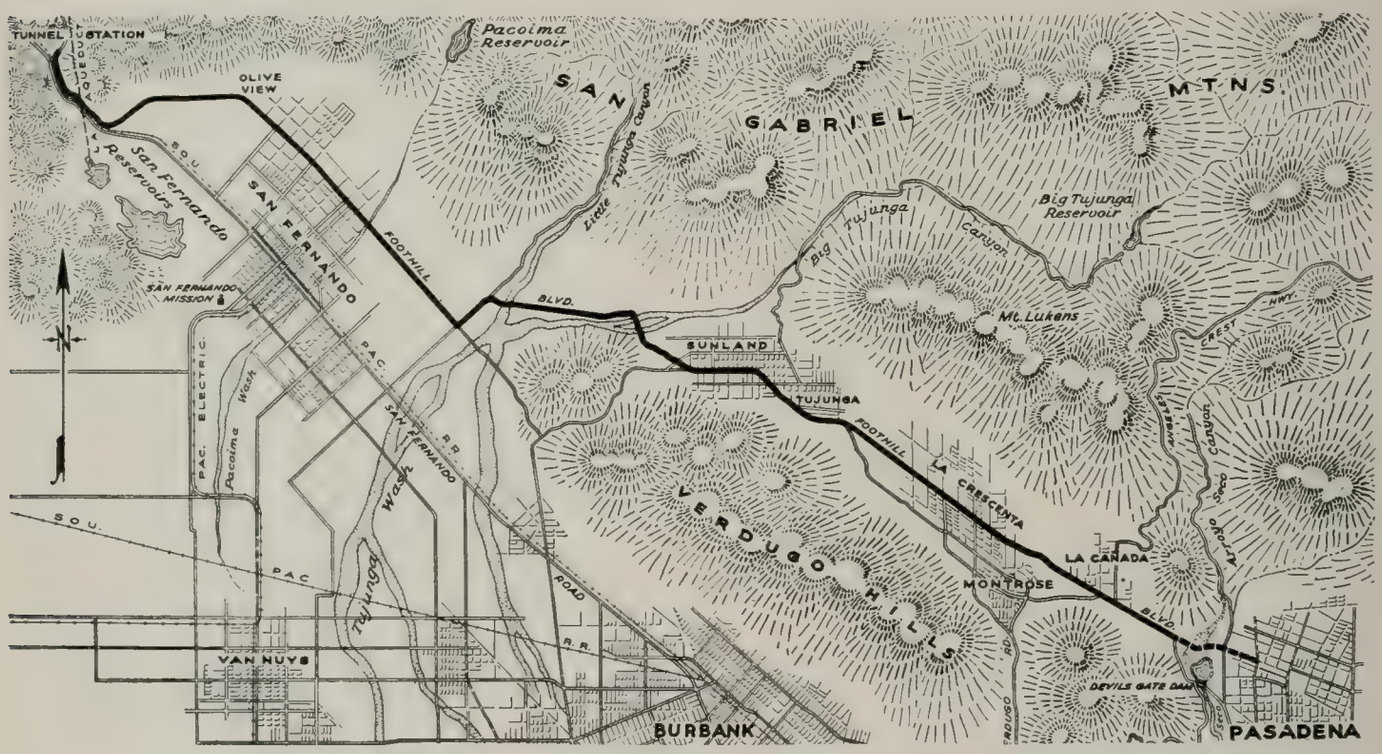
Located entirely within the city limits of Los Angeles, surveys for this project were made and plans prepared by the city engineering department of Los Angeles. Construction of this cutoff with the improvement of the overhead bridge across the Southern Pacific Railroad at Tunnel Station was one of the considerations under which the State Highway Commission caused the Weldon Canyon cutoff, to which the present project connects at Tunnel Station, to be constructed some six years ago.

SURVEYED IN 1928

Surveys were begun by Los Angeles City at that time and it was not then considered within the realm of possibility that the State would adopt this new route as a State highway. Right of way was secured by the city, but the actual construction work was let under a State contract in December, 1933.

This project extends from Olive View Sanitarium, where Foothill Boulevard formerly terminated, along the edge of the foothills, keeping on the opposite side of the main line of the Southern Pacific Railroad from the old highway until Tunnel Station is reached, where the railroad is crossed on an existing overhead bridge which the city shortly intends to widen to accommodate the new route.

The improvement is 3.53 miles in length and consists of a 50-foot graded roadbed and a 20-foot concrete pavement with wide oiled shoulders, in addition to the many necessary drainage structures and other appurtenances.



Map Showing Foothill Boulevard Improvement Near City of San Fernando

(Continued on page 27)

NEW CUT-OFF HIGHWAY for traffic to and from the Foothill Boulevard to Pasadena and State Route No. 4 near San Fernando has been completed and opened to the public. The upper picture shows the cut-off highway at the left connecting with the Newcastle-Saugus route and by means of the bridge with the State Route No. 4 on the right. The latter connects through Weldon Canyon with the Ridge Alternate at Castaic or with the Coast Route via Santa Clara Valley. The lower pictures show the 50-foot graded roadbed and wide oiled shoulders of the new highway winding through orchards and along the foothills.

States Feel Loss of Fuel Revenue from Diesel Equipment

(Continued from page 19)

NO. 13. Modern inventions have caused a great development in construction of highways and in the building of equipment used on highways and in highway construction. The revenue of the States in connection with tax on gasoline applies also to other motor vehicle fuels, but in planning by State highway departments for the expenditure of funds over a two-year period it has been based almost entirely upon the revenue received on tax from gasoline. It has been demonstrated that Diesel operated equipment and the use of similar heavy fuels affords this kind of equipment a greater mileage than gasoline fuel where the same amount of money is involved.

Many States are feeling the loss of revenue because of this condition. Diesel operated equipment is making rapid advancement and unless some action is taken by the States to maintain an equality between tax receipts and highway expenditures when greater expenditures are found necessary as time goes on some thought must be given to maintaining the same amount of revenue as would accrue were all equipment operated by gasoline. The association recommends that the respective State highway departments cause a study to be made of this situation that an equitable State tax be placed on users of Diesel fuels in motor transport.

NAVIGABLE STREAM SURVEY

NO. 14. Many of the States have found it difficult to get an interpretation from the War Department as to when a stream is navigable. Many drawbridges have had to be built across existing waterways whereas the water itself was not deep enough to permit other than small boats to use them. Considerable money could be saved if closed structures could be built and bridge construction was not controlled by conditions calling for excessive heights and widths.

The association requests the War Department to make a determination in each case that a stream is or is not navigable and that usage to a large extent should determine this. The committee on standards of this association is asked to collect information as to the height, width and length of vessels using navigable streams that the information may be had in discussing with the War Department permits for bridges over streams navigable in fact. California is affected by this condition in several places in the northern part of the State.

RESOLUTION OF THANKS

NO. 15. It is the proper and usual procedure at the adjournment of each convention of this association to express proper appreciation to those in whose State the convention is held. The following resolution was passed:

"WHEREAS, The American Association of State Highway officials is concluding its annual sessions after a most beneficial meeting made successful to a great extent by the untiring efforts of our president, secretary, other officials and the people of Santa Fe, the New Mexico State Highway Department, and the citizens of New Mexico in general; therefore, be it

Resolved, That this association express our hearty appreciation of the manner in which the various features of this annual convention have been carried out to His Excellency, A. W. Hockenhull, Governor of New Mexico, the New Mexico State Highway Commission, the State Highway Engineer, and all those who assisted them in making this convention a success.

MAINTENANCE CREW DRAG STALLED AUTOS THROUGH HEAVY SNOW TO SAFETY

Grass Valley, California,
November 24, 1934.

Mr. John W. Howe, Editor,
Department of Public Works Bulletin.

Dear Sir: As you know, the opening of the Tahoe-Ukiah Highway three miles east of Emigrant Gap took place in a driving snowstorm. It might well be of interest to the readers of your magazine to have a picture of the work done by State Division of Highway forces.

For several days previous to the opening ceremonies the snow had been falling at the upper elevations of the Sierra Nevada. All night Saturday the Nevada City unit, under the direction of Fred Garrison, Maintenance Superintendent, had kept the Tahoe-Ukiah open to the junction with U. S. 40 near Cisco. After the dedication a caravan of perhaps 45 cars started back toward Nevada City and Grass Valley. When they reached the steep grade along the old section of road climbing out of Bear Valley many of the cars became stuck. Even with chains it was nearly impossible to make the climb and many had no chains.

Garrison took charge of the situation and right after darkness settled down, amid the heavily falling and drifting snow, with the aid of his willing and skilled State employees and their plows, the last of the stalled cars was hauled to the top of the grade and sent down the long Washington Ridge into Nevada City. Among the last cars to reach the top, and therefore in grave danger of being snowed in for the night, was that of Deputy Director of Public Works Edward J. Neron. Governor Merriam's car had been pushed to the top of the grade by a snow plow earlier in the afternoon.

We, who live in the high Sierra, recognize this as the type of work performed by the mountain divisions of our State's maintenance forces throughout each winter.

Very sincerely,

J. L. WOLFF,
Chairman Committee on Arrangements.

SLIDES MENACE NEW ROADS

Due to danger of slides, it has been necessary to close the uppermost four-mile link of Angeles Crest Highway in Los Angeles County. The five-mile link from the end of this road at Red Box to Mount Wilson will also remain closed until late February at least because of weather conditions, which might cause slides, and heavy construction work still in progress under direction of the United States Bureau of Public Roads.

Governor Merriam has sent the State Engineer to Washington to confer with Federal officials concerning the early financing of the Central Valley water project. The Districts Securities Commission approved plans of a number of districts for refunding outstanding bonds through R. F. C. loans. A total of 71,391 man-hours of S.E.R.A. relief labor is reported to date on flood control projects. Dam applications and approvals, flood measurements and other activities of the Division are detailed in the monthly report of the State Engineer as follows:

IRRIGATION DISTRICTS

The regular semiannual meeting of the Irrigation Districts Association was held in Lindsay, California, October 12–13, 1934. Among the topics under discussion were the progress of refinancing irrigation districts, the redemption of tax sales, and the power problem.

Districts Securities Commission.

The matters coming before the Commission at its regular monthly meeting, held November 9th, were as follows:

Corcoran Irrigation District.—Approval granted of plan to refund its outstanding bonds through a loan from R.F.C.

West Side Irrigation District.—Request for approval of an expenditure of $7,267.65 for lining with concrete certain district ditches, was referred to the State Engineer for report.

Merced Irrigation District.—Approval of expenditure of $5,819 for installation of two drainage wells was granted.

Jacinto Irrigation District.—Plan to refund outstanding indebtedness through a loan from R.F.C. was given favorable consideration.

Glenn-Colusa Irrigation District.—Refunding plan approved through loan from the R.F.C.

Cordua Irrigation District.—Letter from bond counsel requesting action be taken rescinding certification of unsold bonds of the district's Second and Refunding issues. Favorable action taken to facilitate R.F.C. loan.

Princeton-Codora-Glenn Irrigation District.—Plan approved for refunding outstanding indebtedness through loan from the R.F.C.

Paradise Irrigation District.—Petition for approval of refunding bonds for certification was favorably acted upon.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period routine maintenance work has been carried on with a small force on the flood control project. The rains during the past week have brought some water into the Sutter By-pass and boards have been removed from all weirs. Repairs have been made to several of the by-pass structures and gates, and preparations are being made to blade certain portions of the roads on the levees. Work of protecting the west wing of Parks dam in the Sutter By-pass, near the southwest corner of District No. 1660, has been completed with the exception of placing the cobble revetment.

Sacramento Flood Control Project.

The recent rise in the Sacramento River has made it necessary for contractors to discontinue work on the Butte Slough outfall structure, and it is possible that work can not be resumed until spring.

S.E.R.A. Relief Work.

This office has been directing the activities of several S.E.R.A. projects sponsored by the State Reclamation Board and this Division, for clearing timber and brush from flood channels. Supervision, tools and, in some cases, transportation are furnished. During this period a total of 19,900 man-hours of relief labor has been utilized, an average of 186 men having been employed.

The total man-hours of S.E.R.A. relief labor worked to date is as follows:

	Man-hours
Federal Transient Service, upper Sutter By-pass	4,506
Federal Transient Service, Tisdale By-pass	564
Federal Transient Service, lower Sutter By-pass	13,620
S.E.R.A. Project No. 35-B14-27, American River	27,214
S.E.R.A. Project No. 58-B14-15, Feather River	18,053
S.E.R.A. Project No. 57-B14-4, Sacramento By-pass	1,602
S.E.R.A. Project No. 35-B14-40, Mokelumne River	5,832
Total	71,391

(Continued on page 30)

50,500 Cubic Yards Moved by Blast

(Continued from page 4)

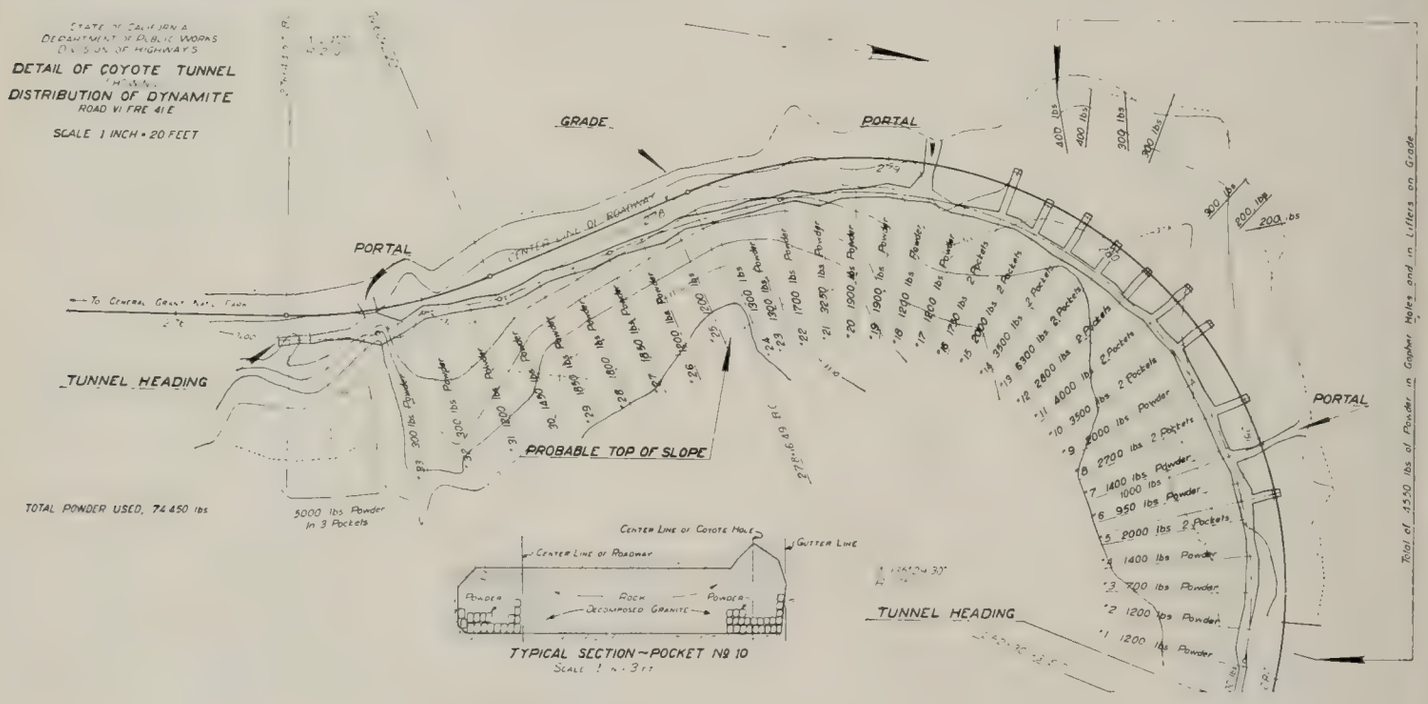
panded, providing the force required to move this large volume of solid rock. This backfill material was all transported by wheelbarrow into the tunnel from the west portal, the maximum distance being about 800 feet. During the time this work was in progress three shifts, of eight hours each, kept it going continuously.

Because of the large number of caps to be exploded, 78 in all, it was not considered advisable to use the regular hand operated blasting machine. A 1500-watt, 110-volt, direct-current, gasoline-driven electric generator was available, which was used for supplying the electric energy needed. The caps were wired in a graded parallel-series of 16-26-36

tion after the blast it was found that the westerly 200 feet had broken to a seam that was nearly vertical and it is expected when the cut is measured, it will be found that the material moved does not greatly exceed that of the planned section.

Owing to the nature and position of the terrain of this point considerable difficulty was experienced by the engineering party in making the surveys. A portion of the center line fell on a sheer vertical wall which made it impossible to run in the line or take cross-sections in the usual manner.

A traverse line was run over the point and below the roadway, and points were established where it was found possible. From



Dynamite Distribution Is Shown in this Coyote Tunnel Plan

which accounts for the entire 78 caps of the shot.

50,500 CUBIC YARDS MOVED

The distance covered by the shot, along the center line of the roadway, was between engineer stations 276+44 and 282+12 making a length of 570 lineal feet. The roadbed is 24 feet with standard widening on the curve and cut slopes of $\frac{1}{4}$ to 1. The material in the planned section between these stations amounted to 50,500 cubic yards.

It was anticipated that there might be considerable overbreak, possibly bringing the total to 75,000 cubic yards. Upon examination after the blast it was found that the westerly 200 feet had broken to a seam that was nearly vertical and it is expected when the cut is measured, it will be found that the material moved does not greatly exceed that of the planned section.

these points the elevations and distances were secured by the most convenient method of triangulation, stadia or slope measurement. Nearly 1000 of these were necessary to work to the accuracy that was desired.

With the data obtained in this manner a map of 5-foot contour interval was prepared on a 10 feet to the inch scale and from this the cross-sections were platted, making it possible to compute the volume of the material to be moved.

Hubby—"The bank has returned that check."
Wife—"Isn't that splendid! What can we buy with it this time?"—*Answers* (London).

Tahoe-Ukiah Lateral Links Scenic Coast and Mountain Areas

(Continued from page 2)

the project's organization, Foote conceived the idea of the cross-state route which took sixteen years to complete.

This highway runs between Emigrant Gap, connecting with the main San Francisco-Reno Highway, and Ukiah on the Redwood Highway, bisecting the east and west side Pacific Highways at Marysville and Williams, and circling Clear Lake and Blue Lakes in Lake County.

The new highway unit just completed lies between Bear Valley and Emigrant Gap in Nevada County. It is 4.2 miles in length and the traveled way consists of a 20-foot width of asphalt—mixed rock. The project cost approximately $238,000. Since 1916 the State has expended more than $3,000,000 in grading, realigning and surfacing approximately 160 miles of the Tahoe-Ukiah lateral. There remains some mileage in Yuba and Nevada counties that requires widening, realigning and surfacing.

THROUGH HISTORIC COUNTRY

In Lake County there remains a short sector of 2.5 miles near Upper Lake which is soon to be regraded and surfaced at the cost of $95,000. Allocation of funds for this work already has been made as part of the $7,932,-206 Federal road funds granted California.

On the completed sections of the highway the road from shoulder is 24 feet wide and for the greater part of its length is surfaced to a width of 20 feet with bituminous crushed rock or oil sealed gravel. On the floor of the Sacramento Valley the paving is principally of concrete and of the same width.

Entering the new highway at its junction with Victor Highway, the motorist is confronted with a magnificent view of Lake Spaulding and from then on is afforded a galaxy of magnificent mountain scenery.

Nevada City and Grass Valley, through which the highway passes, are both imbued with romantic and historic interest which can not fail to lure the tourist. Proceeding westward the highway goes through the old ghost town, Rough and Ready, famed as a mining camp in California's early days. Next it passes through Smartville, another historic mining camp and then through the site of Timbuctoo, made famous by Bret Harte. All that remains of this romantic old mining community is the stone general store and Wells Fargo office, from which millions of dollars in gold dust were shipped in the early days.

THROUGH COAST RANGE

Continuing west the highway passes through Marysville and Yuba City and across the floor of the Sacramento Valley through the fertile rice fields of Yuba, Sutter and Colusa counties, passing through the towns of Sutter, Colusa and Williams.

From Williams the highway again enters a mountainous section continuing through the Coast Range and over a summit from whence it drops to the level of beautiful Clear Lake.

At this point a junction permits the motorist either to continue over the Ukiah-Clear Lake-Tahoe Highway, which skirts the north shore of Clear Lake and the shores of Blue Lake en route to Ukiah, or to follow the highway to Lower Lake, which connects with the routing leading to Lakeport and the mountain resort section of Lake County, or with the Silverado Highway over Mt. St. Helena to the Napa Valley.

RUBBER, IRON, SANDSTONE BLOCKS TRIED FOR PAVING

Information from Automotive-Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., states that Milan, Italy, is experimenting with a number of types of pavement, among them being rubber, cast iron and sandstone.

The rubber tiles or blocks have been laid in a section 100 feet long on a street with heavy vehicular and pedestrian traffic. The blocks are rubber composition, about 8 by 11 inches, and 8/10 of an inch thick, with dovetailed edges. They are laid on a thin asphalt cushion on a concrete base eight inches thick.

The cast iron blocks have been placed on a section 180 feet long and 40 feet wide. The base is concrete eight inches thick. The blocks are equilateral triangles with 8-inch sides, about 1½ inch thick at the edges. The under side is hollowed out and the top surface is roughened by small knobs. A block weighs about five pounds. The blocks are laid on a thin layer of cold powdered asphalt and hot tar is applied along the joints between blocks. A light covering of sand is placed on the surface.

On the same street with the cast iron blocks, a section was laid using blocks of hard sandestone (gritstone). The blocks are about 8 by four by 2 1/3 inches with a projecting lower edge which holds them about one-half inch apart. The joints are filled with asphalt filler. The appearance of the blocks is similar to glazed yellow brick.

Court to Clarify Sign Act Provision

(Continued from page 14)

der this procedure expensive to the State, since the cost of storing the signs and the clerical work involved is more costly than the actual removal work.

The survey, it will be observed, serves a double purpose. Not only does it provide for the legal enforcement of the law as it concerns nonconforming displays, but, upon its completion, reliable statistics will be on record, upon which to base estimates of revenue.

MANY EXEMPTIONS CLAIMED

As previously mentioned, about 60 per cent of the advertising displays in the unincorporated areas are located upon the premises upon which the goods advertised are for sale. The law provides exemption for such displays. Many of the industrial advertisers, such as oil companies, tire companies and beverage distributors, have taken refuge in this provision, holding that advertising in the vicinity of a service station, road house or auto camp is therefore exempt. Loss of the regulation of such advertising automatically renders the act about 40 per cent effective.

Legal proceedings are now pending which will clarify this provision and it is possible that the greater portion of this advertising may be ruled to be "general advertising," subject to the permit provisions. Certainly these displays come within the act in all other respects except the "on premise" provision.

With this in view, the inspectors are recording every display which MAY come within the purview of the act and are also preparing violation citations for all which do not conform thereto. Upon the court's decision being made known relative to "on premise" displays, the interested parties will be advised to make compliance through the service of such citations as apply, if this course is indicated.

AWAITING COURT'S DECISION

Mass submission of applications for permits by these larger concerns will finance the completion of the removal of nonconforming displays campaign now under way, which will otherwise be halted due to lack of funds. It is known that some of these companies have hundreds of applications prepared and are only awaiting the court's decision on the friendly suit relative to "on premise" displays before submitting them.

This survey will, of course, cover every public highway in the unincorporated area of the State. Thus a comprehensive census of advertising will be available and an efficient policing program may be maintained.

Fairly satisfactory results have been obtained during the first year of operation under the act considering the opposition encountered, the actual time during which strict enforcement has been possible, and the limited means at the disposal of the administrative body.

More than 10,000 applications for structure permits are on file and some 5600 for sign permits. Over 200 operators have obtained licenses to engage in the business of outdoor advertising as defined by the act.

These figures will of course be augmented as the present campaign of enforcement progresses. Its effect is already noticeable in the increasing volume of applications for permits since its inauguration.

PROGRESS OF SURVEY

The following tabulation shows the progress of the survey of all advertising displays which come within the scope of the act thus far:

State	Route U. S.	From	To	Miles
3	99-E	Sacramento	Red Bluff	139
7	99-W	Sacramento	Red Bluff	134
7	99-50	Sacramento	Los Angeles	406
7	40	Oakland	Davis	85
5	50	Stockton	Hayward	70
2	101-W	San Francisco	San Jose	50
69	101-E	Oakland	San Jose	54
2	101	San Jose	Mexican Border	510
1	101	Sausalito	Ukiah	117
51	---	Santa Rosa	Jenner	30
8	---	Napa	Napa "Y"	6
60	---	Ventura	Serra	120
79	---	Ventura	Castaic	40
68	---	San Francisco	San Jose (Bayshore)	50
55	---	San Francisco	Santa Cruz (Skyline)	80
56	---	San Francisco	Santa Cruz (Coast)	90
56	---	Santa Cruz	Carmel	50
117	---	Monterey	Salinas	18
118	---	Salinas	Castroville	9
12	80	San Diego	El Centro	127
		Total mileage covered		2,185

Approximately 10,000 displays have been recorded. This includes possibly 2500 structures and signs which have already been permitted, since the survey only covers the areas over which traffic is heaviest and advertising most evident. About 40 per cent of the total have been cited as violations.

The cost of inspection is about 25 cents per display. The average cost of removals is $2.

INNUMERABLE VIOLATIONS FOUND

The maintenance forces have effected sign removals on some 400 miles of highway. This does not include the innumerable nonpermitted political announcements, tobacco and quack medicine advertisements, that have been removed and destroyed.

The pictures which illustrate this article were taken during removal operations. The owner of the structure shown in a gore caused by the realigning of the highway at a curve near the entrance to a town protested its removal, contending that discrimination was made, since several other advertising structures were unmolested in that vicinity. Fortunately, the photographer chose this structure, inadvertently supplying conclusive testimony in behalf of the State. This structure, it will be observed, is clearly a violation of the 300 foot prohibition provision of the act as it applies to intersections of right of way lines.

Thousands of dollars have been spent during road construction to preserve the scenery made accessible by our highways. A considerable sum is devoted each year to planting trees and shrubbery and general maintenance of the highway system to maintain a satisfactory appearance. Enforcement of the Outdoor Advertising Act provides the means of protecting this investment.

Traffic Increase Forced Wider Road

(Continued from page 20)

In this connection mention should be made of a new bridge on this route across the spur railroad track leading to the Hercules Powder Company's magazine. This overhead bridge, which is now being completed, was constructed under a separate contract handled by the State Highway Bridge Department.

TOTAL COST $281,000

The curvature on the new cutoff project, although somewhat sharper than present State highway standards for primary routes, is well superelevated to safely permit the passage of high speed traffic. A wide oiled shoulder was constructed on each side, making a traveled way 36 feet wide for the entire distance.

The highway project will cost approximately $230,000 and the bridge over the spur railroad track to the Hercules Powder Company's plant will cost about $51,000, or a total cost of $281,000. This is being financed from the allocation of $275,000 for incorporated cities on the Federal aid system in the budget of the 85th-86th fiscal years, augmented by an allocation of $7,000 of State highway funds.

This project is the latest to be completed of a series of highway improvements on the Foothill Boulevard route between Pasadena and the Los Angeles-Sacramento route, officially designated as Route 4. One of the original State highway routes when the State Highway Department was formed in 1912, this road has steadily grown in importance since that date.

MORE DIRECT ROUTE

The comparatively small amount of traffic in 1912 was carried over a series of connecting county roads which also served the local traffic of San Fernando, Tujunga, La Canada and neighboring communities.

When this route was incorporated in the original State highway system it was with the object of providing a more direct route to central California from Yuma, Imperial Valley, San Bernardino, Riverside, Redlands and all cities along Foothill Boulevard and in the San Gabriel Valley. Connection with Route 4 was made at that time in the business district of San Fernando.

The first step in the development of this route was the construction of a 15-foot concrete pavement from Tujunga to La Canada in 1915–17. During 1917–18 the same type of construction was carried on to San Fernando.

Bridges were constructed across the north and south branches of Big Tujunga River in 1921 so that by 1922 there was a 15-foot concrete pavement from San Fernando to La Canada with satisfactory bridge facilities. The alignment of existing county roads was improved at several locations under these contracts. The route followed an entirely new location from Sunland across Big and Little Tujunga rivers.

TRAFFIC RAPIDLY INCREASED

Traffic on this route increased to such an extent that by 1925 it was necessary to widen the existing 15-foot pavement with a 2½-foot concrete shoulder on each side from San Fernando to La Canada. In the meantime the communities of Sunland, Tujunga, La Crescenta and La Canada grew into thriving towns, which caused a marked increase in local traffic between Sunland and La Canada.

Local traffic in La Crescenta was so dense that by 1927 a full width pavement of 62 feet between curbs was constructed through that town. This work was done under an assessment district. In 1929 a full width pavement was constructed through Tujunga on account of increased local traffic. This was handled as a cooperative improvement toward which the State contributed $10,000.

By 1931 traffic on the more congested portions from Sunland to La Canada had become too heavy to be adequately handled by the existing 20-foot pavement.

Obviously the next logical step in the development of the route was to widen both roadbed and pavement between Sunland and La Canada, which was the most congested portion of the road. In the latter part of 1932 a contract was awarded for widening and improving of alignment from Verdugo Road at La Canada to Tujunga.

"How was it you broke your engagement with Evelyn?"

"Well, I only did to the engagement what it did to me!"—*Earth Mover.*

$700,000 Total Cost for Santa Barbara Cooperative Project

(Continued from page 6)

This project has involved several features, including two highway grade separations, two bridges over Mission Creek, a channel change of Mission Creek about 1100 feet long, and a large arch culvert at San Roque Creek.

INVOLVED GRADE SEPARATION

In designing the route, which was chosen after careful consideration by both the highway engineers and officials of the city of Santa Barbara, special attention was given to the eliminating of traffic congestion, particularly at the Montecito grade separation at the east city limits and the intersection of the new route with the present route at the westerly end of the improvement, the latter being known as the Hollister Avenue braided traffic intersection.

The Montecito grade separation was made a part of this improvement, whereas the Hollister Avenue braided intersection remains for future development when traffic requirements demand such construction. However, right of way for the intersection was obtained as a part of the project.

A feature of the detailed construction was the use of Carpinteria asphaltic sand incorporated into the asphaltic concrete surface. By the production of such material locally it was possible to use more local labor on the project. This material is a sand heavily impregnated with a natural asphalt, particularly adapted to asphaltic pavement construction.

TOTAL COST $700,000

The length of the project is 5.9 miles, of which nearly all is over new right of way. In obtaining the right of way it was necessary to move several buildings, relocate railroad service tracks and move one large lumber yard. The total cost of the project is approximately $700,000.

The project has been financed through State highway funds, including the ¼ cent gas tax fund, the State cooperative fund, and money obtained through the National Recovery Act.

Neighbor—"Where is your brother, Freddie?"

Freddie—"He's in the house playing a duet. I finished first."—*Arcanum Bulletin.*

Large Delegation of California Engineers Attend Conference

(Continued from page 16)

ASPHALT INSTITUTE AND ASPHALT AND ROAD OIL PRODUCERS

Don Bourne, Asphalt Institute, Washington; L. Mittelman, Chief Chemist, and Ted Johnston, Asphalt Salesman, Associated Oil Co. of California; J. M. Hartong, American Bitumuls Co., California.

Albert E. Clark, Insp. Chemist, Gen. Pet. Corp., California; R. O. Steck, Sales Engr., Richfield Oil Co., California.

Representing the Shell Oil Company of California were: P. A. Hahm, Chem. Engr.; Raymond Harsch, Asst. Mgr., Asph. Dept.; C. V. Kiefer; J. F. McSwan, Mgr. Asph. Dept.; Hector J. Pratt, R. S. Russell and L. T. Snyder.

Representatives of the Standard Oil Company of California included: J. A. Blood, Mgr. Asphalt Dept.; Geo. D. Easter, W. N. Morse and C. F. Ramey.

Union Oil Company of California representatives were: C. F. Adam, Supt. Lub. and Asph. Div.; L. B. Beckwith, I. R. Laidlaw and F. P. Smith, Jr., of the Sales Department.

Clint Fulmer, Mgr. Asph. and Road Oil Dept., and G. I. Kirby, Chief Chemist, represented the Utah Oil Refining Co. of Utah.

CALIFORNIA DIVISION OF HIGHWAYS

The delegation from headquarters offices in Sacramento included N. R. Bangert, Asst. Mtce. Engr.; T. A. Bedford, Asst. Eng. Surveys and Plans; H. G. Bennett, Asst. Phys. Testing Engineer; Wm. Bock, Asst. Office Engr.; L. V. Campbell, Engr. City and Coop. Projects; F. H. Cushman, Asst. Office Engr.; R. W. Gillies, Sr. Lab. Aid; F. J. Grumm, Engr. Surveys and Plans; Geo. Hellesoe, Asst. Maint. Engr.; F. N. Hveem, Assoc. Testing Engineer; Wm. J. Hoskin, Jr. Phys. Testing Engineer; J. M. Kane, Asst. Office Engineer; F. T. Maddocks, Sr. Phys. Testing Engineer; Stewart Mitchell, Const. Engr. Bridges; N. W. Pratt, Asst. Engr. City and Coop. Projects; J. H. Obermuller Asst. Engr. Surveys and Plans; C. S. Pope, Constr. Engineer; O. J. Porter, Assoc. Phys. Testing Engineer; R. F. Reynolds, Asst. Office Engr., Central Office; R. L. Richardson, Materials and Research Laboratory; E. J. Saldine, Asst. Office Engineer; W. A. Smith, Asst. Maint. Engineer; J. G. Standley, Prin. Asst. Engr.; T. E. Stanton, Materials and Research Engineer; G. A. Tilton, Jr., Asst. Constr. Engr.; R. H. Wilson, Office Engineer; Geo. R. Winslow, Asst. Const. Engr.; E. Withycomb, Asst. Constr. Engr., and C. F. Woodin, Asst. Maintenance Engineer of Sacramento.

Division of Highways representatives from out of town included R. S. Badger, Dist. Constr. Engr.,

CALIFORNIA OFFICE ENGINEERS—Back row, left to right—J. M. Kane, A. D. Griffin, H. L. Cooper, B. W. Booker, A. Coonrod, William Bock, R. F. Reynolds, E. J. Saldine, F. H. Cushman. Front row,E. J. Bassett, Ira G. Thomas, Guy McKinney, C. F. Waite, C. J. Temby, C. P. Sweet, J. C. More, R. H. Wilson, Headquarters Office Engineer.

CALIFORNIA CONSTRUCTION ENGINEERS—Front row, left to right—G. A. Tilton, G. R. Winslow, H. M. Hansen, C. M. Butts, C. S. Pope, E. Withycombe, A. N. George, E. R. Green. Rear row—C. Cleman, E. G. Poss, J. B. Hodges, P. R Lowden, E M. Cameron, R. L. Beuthel, R. S. Badger, J. M. Lackey.

E. Evers, Dist. Maint. Engr., and C. F. Waite, Dist. Office Engineer, from Dist. VI, Fresno; E. J. Bassett, Dist. Office Engr., M. C. Fosgate, Dist. Maint. Engr., J. B. Hodges, Dist. Const. Engr., and P. R. Lowden, Convict Camp Engr., from Dist. II, Redding.

From District VII, Los Angeles, came W. S. Bennett, Jr., Testing Engineer; A. N. George, Dist. Const. Engr.; A. D. Griffin, Asst. Dist. Office Engr.; J. M. Lackey, Asst. Dist. Const. Engr.; S. C. McCulloch, Asst. Test. Engr.; J. C. More, Dist. Office Engineer; E. S. Gripper, Res. Engr.; Fred A. Read, State P.W.C. Engineer, and I. S. Voorhees, Dist. Maint. Engr.

San Diego, District XI, was represented by R. L. Beuthel, Dist. Const. Engr.; Earl E. Sorenson, Dist. Maint. Engr., and Ira G. Thomas, Office Engineer.

B. W. Booker, Dist. Office Engr.; C. E. Bovey, Dist. Maint. Engr., and C. M. Butts, Dist. Constr. Engr., represented Dist. X, Stockton.

E. M. Cameron, Const. Engr.; Ches. P. Sweet, Dist. Office Engr.; J. F. Taylor, Maint. Engr., and R. L. Thomas, Dist. Maintenance Engr., came from Dist. I, Eureka.

C. Clemon, Dist. Const. Engr.; J. L. Piper, Dist. Maint. Engr., and C. J. Temby, Dist. Office Engr., from Dist. III, Marysville.

A Coonrod, Office Engineer, and Jos. E. Stanton, Dist. Maint. Engr., Dist. VIII, San Bernardino.

L. E. McDougal, Dist. Maint. Engr.; H. L. Cooper, Acting Office Engineer, and E. R. Green, Dist. Const. Engr., Dist. V., of San Luis Obispo.

Guy McKinney, Acting Dist. Office Engineer, and H. M. Hanson, Act. Dist. Const. Engr., Dist. IX, Bishop.

District IV, San Francisco, was represented by R. P. Duffy, Dist. Maint. Engr., Don Miller, Mgn. Engineer; John F. Nelson, Junior Engineer-General Const. and E. J. Ross, Dist. Const. Engineer, and E. R. Hoffman, Asst. Phys. Test. Engr.

River Project for S.E.R.A. Labor

(Continued from page 23)

An S.E.R.A. project, sponsored by the State Reclamation Board, has been approved for clearing the Feather River overflow in Yuba County, providing for 45,920 man-hours. This work will complete clearing of the channel on the east side of the Feather River from Bear River to the upper side of Starr Bend.

Flood Measurements and Gages.

Preparations are complete for the operation of the gages maintained during the winter season by this office. Last summer the Bristol gage installation at West Butte was destroyed by fire, and in its stead a new installation consisting of a pipe well and Stevens Type "E" recorder is being placed on the concrete abutment of the Mawson bridge in the Butte Slough By-pass.

WATER RIGHTS

Thirty-three applications to appropriate were received during October; 12 were denied and 16 were approved. In the same period 6 permits were revoked and 12 licenses were issued.

ADJUDICATIONS

South Fork Pit River (Modoc County)—The Superior Court of Modoc County entered a decree on October 30, 1934, in the case of W. E. Armstrong, et ux. vs. Frank McArthur, et al. There are 181 diversions serving 20,400 acres of irrigated land on 37 ranches involved in this proceeding. The aggregate of the adjudicated rights is 260.8 cubic feet per second. The decree was based upon a stipulation for judgment.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

During the past month, practically all Sacramento River irrigation diversions were finished for the season and the flow of the river at Sacramento has varied from 5000 to more than 7000 second-feet, the latter resulting from the rainfall early in November. At the same time the flow of the San Joaquin River near Vernalis increased to about 1500 second-feet.

Due to the increased river flow there has been a considerable recession of the salinity in the Delta so that the sampling at a number of upper stations was discontinued. Lower stations will be maintained until the salinity has dropped to normal winter conditions and sixteen key stations on the upper bays and in the Delta are maintained permanently. The following tabulation compares the salinity at Bay and Delta stations on November 10th, 1924, 1931, and 1934:

Comparison of Salinity at Bay and Delta Stations on November 10, 1924, 1931 and 1934

	Salinity in parts of chlorine per 100,000		
	1924	*1931*	*1934*
Point Orient	----	1785	1740
Bullshead Point	----	1360	1240
Bay Point	----	1155	1060
O and A Ferry	456	780	520
Collinsville	206	590	480
Emmaton	26	289	136
Rio Vista Bridge	6	132	12
Liberty Ferry	9	39	8
Reclamation District 2068 Intake	----	127	44
Antioch	176	560	180
Jersey	98	300	210
Ward Landing	----	163	60
King Island Pump	82	167	60
Rindge Pump	48	107	28
Middle River P.O.	136	212	38

DAMS

During the past month the following applications have been filed:

1. Application for approval of the plans and specifications for the construction of the Patterson dam, a collapsible timber structure in the San Joaquin River near Patterson, San Joaquin County. The dam is to have a height of 11 feet, storing 1783 acre-feet and costing $14,000.

2. Application for approval of plans and specifications for the enlargement of the Hall Canyon dam, an earthfill structure located in Ventura County. The work consists of a raise in crest elevation of approximately 5 feet, the construction of a new concrete spillway and a concrete diversion channel from a diversion dam above. The work is estimated to cost $15,000.

3. Repair application for the raising of the crest and enlargement of the spillway of the Duncan earthfill dam in Modoc County.

4. Repair application for refacing and strengthening the upstream cribs and bulkheads of the Gerig crib and earth dam, located on the Pit River in Lassen County.

Applications approved during the past month are as follows:

1. November 7, 1934, construction application of the Almaden dam of the Santa Clara Water Conservation District, located on Almaden Creek in Santa Clara County. This will be an earthfill structure 97 feet high, storing 2000 acre-feet and costing $210,000.

2. November 17, 1934, construction application of the Stevens Creek dam of the Santa Clara Valley Water Conservation District located on Stevens Creek in Santa Clara County. This will be an earthfill dam 110 feet high storing 4000 acre-feet and costing $320,000.

3. November 14, 1934, enlargement of the Hall Canyon dam described above.

(Continued on page 32)

Photo Courtesy of Los Angeles Times

NEW CUT-OFF TO SEA—P. A. Stanton, State Highway Commissioner representing Governor Merriam, is shown cutting ribbon, at dedication exercises conducted on the new bridge spanning Santa Ana River. The new bridge and the new Harbor Boulevard were formally opened. Left to right: John C. Mitchell, Supervisor Second District; Miss Jewel Cawthon as Miss Anaheim; Commissioner Stanton; Miss Mary Jean Mason as Miss Newport and George Jeffrey, Supervisor Fifth District.

Stanton Dedicates Bridge and Road

Harbor Boulevard, newest addition to the State's highway system in Orange County and the new concrete Buaro Bridge which spans the Santa Ana River, about five miles southwest of the city of Santa Ana were officially dedicated recently when State, county and city officials and private citizens united in ceremonies on the bridge.

Residents of the citrus and oil districts are thus brought three miles closer to the people of the harbor district of Newport Bay.

STANTON CUTS RIBBON

P. A. Stanton, State Highway Commissioner, spoke for Governor Merriam in dedicating the new projects. The highway was opened when he cut a ribbon and two beautiful maidens joined hands in a bond of friendship.

Miss Jewel Cawthon of the Anaheim Union High School, representing the north, was introduced by Secretary George Reid of the Anaheim Chamber of Commerce. Miss Mary Jean Mason of the Newport Harbor Union High School, representing the south, was introduced by Secretary Harry Welch of the Newport Harbor Chamber of Commerce.

Supervisor George Jeffrey christened the project with water from the Pacific Ocean and Supervisor John Mitchell christened with a bottle of water from the Santa Ana River.

The bridge is located on a feeder highway in Orange County between Anaheim on State Route 2 and Newport Beach on State Route 60. It has a total length of 376 feet with eight 47-foot spans. It is a steel beam structure with a 30-foot roadway and one 4-foot sidewalk. The total cost was $42,848.

The bridge with about one and one-half miles of new road closes a gap in a through route for farm trucking and recreational traffic to harbor and beaches.

Highway Bids and Contract Awards Made in October

LOS ANGELES COUNTY—Between west city limits and Beverly Blvd., Los Angeles, 0.6 of a mile grading, paving with asphalt concrete. District VII, Route 60, Section B. J. L. McClain, Redondo Beach, $80,379; Southern California Roads Co., Los Angeles, $86,026; C. O. Sparks, Los Angeles, $86,394; Oswald Bros., Los Angeles, $86,795; Griffith Co., Los Angeles, $91,515. Contract awarded to Los Angeles Paving Co., Inc., Los Angeles, $77,240.50.

LOS ANGELES COUNTY—Between Loma Ave. and Hathaway Ave., about 0.5 mile, to be graded and paved with Portland cement concrete. District VII, Rt. 60, Sec. L. Bch. Griffith Co., Los Angeles, $55,882; J. L. McClain, Los Angeles, $60,648; Geo. R. Curtis Pav. Co., Los Angeles, $68,934; B. G. Carroll, San Diego, $61,028; Basich Bros., Los Angeles, $61,897; Matich Bros., Elsinore, $65,788; Byerts & Dunn, Los Angeles, $66,814; C. O. Sparks, Los Angeles, $68,952. Contract awarded to Sully-Miller Construction Co., Long Beach, $54,293.50.

LOS ANGELES AND SAN BERNARDINO COUNTIES—Between 5½ miles east of Llano and Camp Cajon, 6.6 miles grade and treat with fuel oil and bituminous surface treatment. District VIII, Route 59, Secs. G and A. Sharp & Fellows Constr. Co., Los Angeles, $28,063; C. O. Sparks, Los Angeles, $30,739; United Concrete Pipe Corporation, Los Angeles, $32,500. Contract awarded to Geo. Herz & Co., San Bernardino, $24,779.60.

MARIN COUNTY—Between Greenbrae and Alto, about 0.3 mile. Slides to be removed. District IV, Route 1, Sec. C. A. Teichert & Son, Inc., Sacramento, $46,250; Healy-Tibbits Construction Co., San Francisco, $44,450; Young & Son Company, Ltd., Berkeley, $49,250; Peninsula Paving Company, San Francisco, $39,500; D. McDonald, Sacramento, $30,000; Hanrahan-Wilcox Corporation, San Francisco, $39,750; Rocca & Caletti, San Rafael, $44,250; Larsen Bros., Sacramento, $58,250; Piombo Bros. & Co., San Francisco, $39,875; F. J. Main, Fairfax, $61,750; Granfield, Farrar & Carlin, San Francisco, $33,750. Contract awarded to Union Paving Co., San Francisco, $29,750.

PLACER COUNTY—In Roseville from Church St. to northerly city limits, 0.6 mile to be surfaced with bituminous treated crushed gravel or stone. District III, Route 3, Sec. Rsv. Claude C. Wood, Stockton, $7,844; Pacific States Construction Co., San Francisco, $10,733; R. R. Carlson, Vallejo, $8,303; Hemstreet & Bell, Marysville, $9,222; A. Teichert & Son, Inc., Sacramento, $8,062; Lee J. Immel, $9,894. Contract awarded to T. M. Morgan Paving Co., Loomis, $7,315.20.

PLUMAS COUNTY—Between Rock Creek and Storrie, about 2.5 miles to be graded. District II, Route 21, Sec. A. Young & Son Company, Berkeley, $158,184; Granfield, Farrar & Carlin, San Francisco, $166,319; D. McDonald, Poulos & McEwen, Sacramento, $168,242; A. Teichert & Son, Inc., Sacramento, $168,769. Contract awarded to Peninsula Paving Co., San Francisco, $152,625.80.

SAN DIEGO COUNTY—Approaches to Escondidio Creek bridge, about 0.6 mile to be graded and surfaced with bituminous treated crushed gravel or stone. District XI, Route 2, Sec. A. Geo. J. Bock & Son, Los Angeles, $47,673; Wm. C. Horn Co., Pomona, $51,236; Griffith Corp., Los Angeles, $53,689; C. O. Sparks, Los Angeles, $55,281; V. R. Dennis Construction Co., San Diego, $56,005; Daley Corp., San Diego, $57,581; Walter Trepte, San Diego, $58,161. Contract awarded to Sharp & Fellows Constr. Co., Los Angeles, $42,807.75.

SONOMA COUNTY—Furnish and apply fuel oil to existing road bed, between Jenner and Mendocino County line, about 39.4 miles. District IV, Route 56, Secs. C, D, E. C. F. Frederickson & Sons, Lower Lake, $4,421; Hayward Building Materials Co., Hayward, $5,994; Chas. Kuppinger, Lakeport, $4,329; E. A. Forde, San Anselmo, $5,272. Contract awarded to Helwig Construction Co., Sebastopol, $4,236.50.

I paid a hundred dollars for that dog. He's part collie and part bull.

Which part is bull?

That part about the hundred dollars.

CLUB SENDS THANKS FOR EFFICIENT SAFETY WORK

Stinson Beach, Cal., Nov. 21, 1934.

Mr. T. H. Dennis,
State Maintenance Engineer,
Sacramento, California.

Dear Sir: Some months ago, we expressed, for this club and our community, appreciation for the white "traffic line" placed on the highway to Stinson Beach.

We made no audible comment later, when some of the natural barriers along the road—tree trunks, rock faces, culvert basins—were painted white to define the edges, but each time we drove in a fog, we registered, mentally, a prayer of thanks.

Now that white posts are being placed along the most dangerous curves, we write again that you may know we are grateful.

We would also commend the efficiency of the "road crew." Wednesday's rain brought down from the cliffs considerable dirt and rock but it was all cleared Thursday. Sundays much heavier rain brought down tons of rocks, making the inside lane impassable for some distance, along several miles. They were all cleared away Monday.

Again we say, "Thank You."

THE PROGRESSIVE CLUB OF STINSON BEACH.
(Signed) W. B. Marble, President.

WATER RESOURCES

(Continued from page 30)

4. October 30, 1934, repair application of the Gerig dam, described above.

WATER RESOURCES

South Coastal Basin Investigation.

The text of Bulletin 45, the subject of which is the alluvial geology and underground basin capacity of this area, has been completed and is now in the hands of the State Printer for publication. Other work on the South Coastal Basin investigation is continuing along routine lines.

Central Valley Project.

Additional data are being prepared upon the financial and economical aspects of the project for presentation to the Federal Public Works Administration in connection with the application made by the Water Project Authority of California for a loan and grant for the construction of the project. This matter has received the serious consideration of Governor Merriam and the Director of Public Works and only recently the State Engineer was authorized to proceed to Washington as soon as possible for conferences with United States officials concerning the early Federal financing of the project.

Respectfully submitted.

EDWARD HYATT,
State Engineer.

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

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C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary

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R. H. WILSON, Office Engineer
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C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
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DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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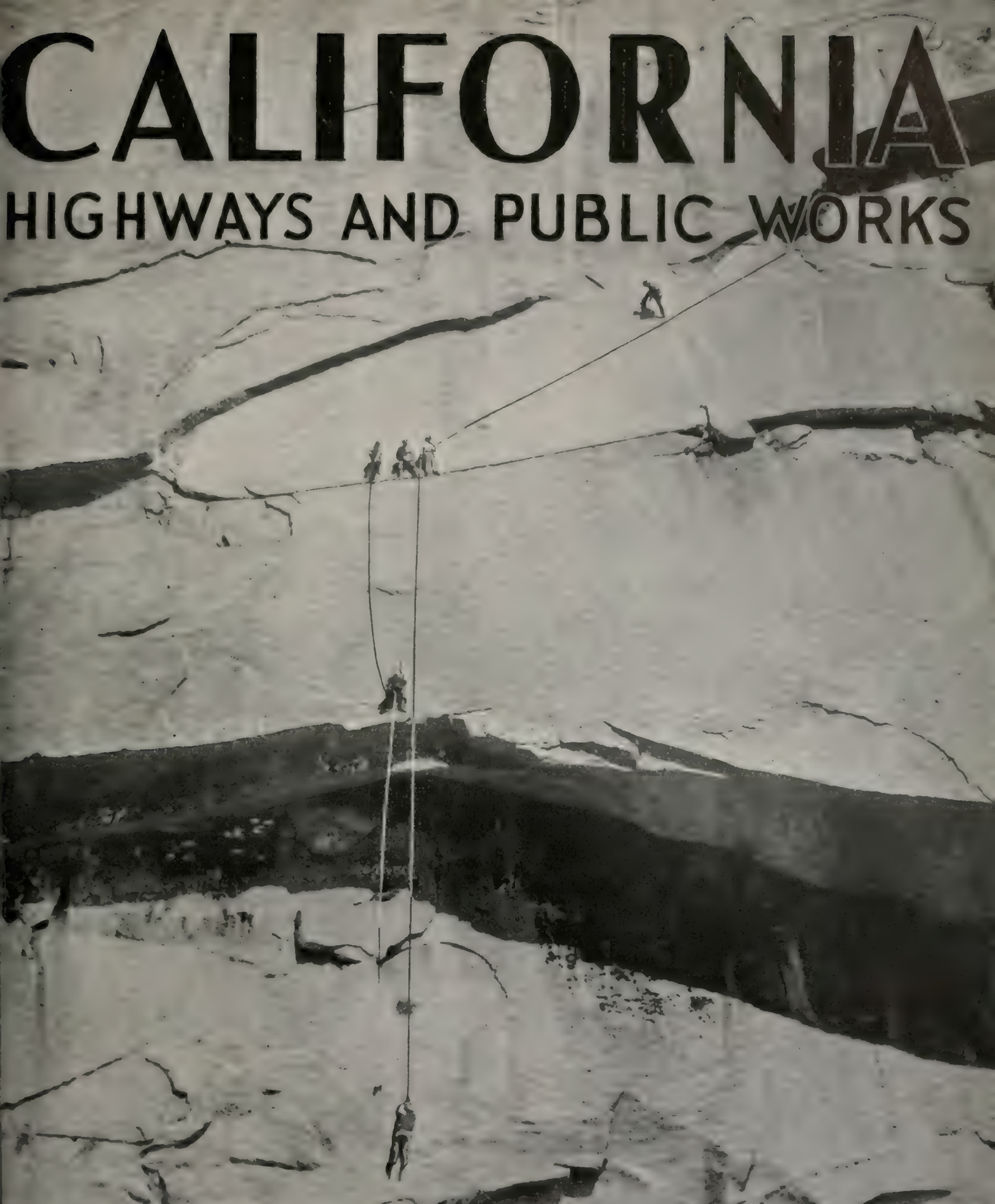
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



Survey Party working on Arch Rock in Feather River Canyon, State Route 21

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$26,498,980 for Highway

Construction of Major Projects

In Biennial Budget

For 87th and 88th Fiscal Years

By HARRY A. HOPKINS, Chairman California Highway Commission

THE biennial State highway budget for the 87th and 88th fiscal years, July 1, 1935, to June 30, 1937, was adopted by the California Highway Commission on December 27, 1934, and presented to Governor Merriam.

The budget shows that after deductions for maintenance of our 14,000 mile State highway system, for the one-quarter cent allocation to cities, rights of way, joint highway districts, engineering, minor improvements, contingency reserves and administration, the total amount for major project construction throughout the State will be $26,498,980.

HARRY A. HOPKINS

The budget includes an estimate of the revenues which will become available for all State highway purposes in this next biennial period under present constitutional and legislative provisions. These estimated revenues are allocated for contemplated expenditures during the biennium in accordance with the various legal enactments governing such expenditures. They are allocated to the northern and southern county groups and to primary and secondary highways.

The total estimated revenues for the next biennial period from all sources for State highway purposes is $61,393,459.70 compared with $70,136,000 for the current biennium. The sources of this total revenue are the motor vehicle fuel tax, or gas tax, motor vehicle license fees, and Federal aid appropriations made by Congress.

Gas tax and motor vehicle fees, which are provided by State legislation, form the major portion of these estimated revenues. In previous bienniums an additional source of revenue existed, known as the highway transportation tax. This source of revenue has been eliminated by the enactment of the so-called Riley-Stewart Plan of taxation.

The estimated revenue produced by the gas tax is $46,500,000 for the two-year period. One-half of the net motor vehicle fees, after deducting the amounts necessary for the support of the Motor Vehicle Department and the California Highway Patrol, is estimated to be $5,308,000 for the two-year period.

Various enactments adopted at the 1933 sesssion of the Legislature have occasioned material reduction in the revenues available for State highway purposes. The elimina-

(Continued on page 23)

$3,000,000 Needed to Make Bridges on Secondary Roads Safe for Legal Loads

By **STEWART MITCHELL,** Constructing Engineer of Bridges

ALL ROADS acquired during the development of the State highway system may be grouped into two general classes: (1) new traffic arteries built on modern standards of construction, either serving sections where there were no existing roads or replacing inadequate highways, and (2) existing highways which have been taken over for maintenance with such relatively minor improvements as will permit them to serve the existing needs in a fairly satisfactory manner.

Bridges on roads which come under the second classification furnish many serious problems. It is quite true that there are bridges on roads taken over from the counties that were capably built to standards at least approximating our present standards, and these bridges are still capable of safely carrying present day traffic.

However, due to limited inspection, and in a few cases to faulty design, there are numerous instances of rapid deterioration or incipient failure. These cases are causing concern as to their safety now or in the not far distant future.

SOME MADE SERVICEABLE

Very often an inspection shows that the condition can be corrected at comparatively small expense and thus the structure may be made to serve for many years, provided its roadway width and approach alignment are adequate and safe for traffic. In many cases bridges built in the old horse-and-buggy days or the early stages of automobile traffic are still sound. They were, of course, not designed for the modern heavy and fast loads which now use them and their width of roadway or alignment of approaches is very likely to be too narrow or too crooked for safety.

It is a problem, then, to decide whether it is economical to strengthen or widen such structures or to replace them with new bridges on modern standards of design and highway location.

In other cases, bridges of a more or less temporary nature (which may or may not have been strong enough originally to carry present legal loads) are nearing the end of their useful life. Due to the considerable number of such cases, it is often impossible to obtain the necessary funds to immediately replace them. Again, a revision of the roadway alignment may be contemplated in the near future and a new bridge built on the existing line would, therefore, have to be discarded at a considerable financial loss when the highway is relocated. In such cases it becomes necessary to determine the most economical means of strengthening the structure so that it can continue to serve existing conditions for a few more years.

IMPROVEMENT BRINGS TRAFFIC

Bridges built in the outlying sections of the State, on roads that are lightly traveled, occasionally carry heavy loads of logs, mining machinery or various implements of husbandry. These bridges, although built of local materials and without any plans or designing outside of the native ingenuity and judgment of their builders, have successfully served their purpose in most cases.

When such roads are taken over by the State and the demand arises for their improvement—as it usually does—it often happens that the improvement of roadbed and surfacing changes the nature of its traffic and causes the bridges to become a serious hazard.

If all these low standard bridges were to have their allowable loading determined by applying the factors of safety used in modern bridge design, many roads or sections of roads would be practically closed to traffic.

In such cases the Bridge Department investigator has to take into consideration the matter of the actual nature of traffic using that road at the present time, or likely to use it in the near future. He investigates the physical condition of the materials in the bridge and considers how well they have stood up under the traffic. The danger to traffic in case the weakest members in the bridge should fail under load must also be considered. After taking these factors into account, he must determine a maximum load for which the structure will be legally posted if the

(Continued on page 14)

OLD BRIDGES FOR NEW—Examples of the 1235 bridges taken over by the State with Secondary Roads. 1—Old wooden structure across San Juan Creek between Santa Margarita and McKittrick 2—Cables and temporary bents prevent collapse of this bridge across Kern River at Isabella, posted for five tons. 3—Deterioration of this bridge on Route 149, Santa Barbara County, compelled posting for 10 tons. 4—Dilapidated bridge across Dark Gulch, Mendocino County. 5—Timber trestle across Alamo River near Brawley required addition of central "A" framed members. 6—Dilapidated timber trestle across Calloway Canal, on main Truck Route around Bakersfield.

Famous Death Valley Toll Road Purchased, Making It a Free Highway

By **S. W. LOWDEN**, Acting District Engineer.

THE State of California now owns the famous Death Valley toll road, which became a free highway in the State system with the filing of the deed of purchase and abolition of tolls on December 20, 1934.

The road extends from the foot of Darwin Wash across the Argus Mountains through Panamint Valley and over the Panamint Mountains by way of Towne's Pass to Stove Pipe Wells in Death Valley, a distance of approximately 31 miles. It thus provides a western gateway from Owens Valley into Death Valley.

It was constructed in 1926 by H. W. Eichbaum, a Death Valley pioneer resident, under a franchise granted him by the board of supervisors of Inyo County. The franchise was to be in perpetuity unless the county exercised an option to purchase.

ROAD TO BE IMPROVED

Shortly after the inclusion of the Death Valley routing in the State highway system in 1933, the California Highway Commission, with the thought of service to the traveling public uppermost in mind, started negotiations for the purchase of the Eichbaum toll road. After many delays and involved legal and financial questions, the negotiations were brought to a successful conclusion, title vested in the State.

It is anticipated that with present funds remaining intact, this recently acquired highway, which extends over a distance of 31 miles to the floor of Death Valley, will, within a reasonable time, be placed in a condition which will afford comfort and safety to the many travelers entering or leaving Death Valley by this route.

The fees for the use of the road have been $2 per car and 50 cents per person. These charges were immediately abolished by the State when the title was filed and instructions were received from Assistant State Highway Engineer George T. McCoy to take possession of the road for the State and begin maintenance and improvement work. The road becomes a part of Route 127 in the State highway system and constitutes the westerly approach to the Death Valley National Monument, which is under the jurisdiction of the National Park Service.

ROAD CROSSES VALLEY

At Stove Pipe Wells Hotel, on the floor of the valley where the toll road ends, a connection is made with a road through Daylight Pass to the ghost towns of Rhyolite and Bullfrog and thence to Beatty and Tonopah, in Nevada.

State Route 127 bends southeast from Stove Pipe Wells to Death Valley Junction via Furnace Creek and thence south via Shoshone to a connection with State Route 31 (The Arrowhead Trail) at Baker.

A direct east-west road across the valley is thus provided for interstate traffic, and a wonderfully scenic, interesting loop trip through and across the valley is made possible for tourist traffic.

Approximately 2500 square miles of the territory known as the Death Valley area was included into the National Park system by presidential proclamation on February 11, 1933.

BED OF ANCIENT LAKE

Death Valley itself, located in the southeastern part of Inyo County, is the bed of a great ancient lake, enclosed on both east and west by high, precipitous ranges. The area of the valley floor is approximately 400 square miles, a considerable portion of which is below sea level, containing the lowest point on the North American continent. The term "Death Valley" is applied to the entire area, but Death Valley proper, until recently known as a region of dread, is only about 50 or 60 miles long. For more than 40 miles this sink is floored with a saline marsh from one to eight miles wide.

Water, mineralized, is close to the surface. There are a number of springs scattered over the valley, but most of the water holes are small, and the water usually charged with minerals, although considered safe for use. The springs commonly known as poison springs do not actually contain arsenic, but are charged with Epsom and other salts, and are fatal only because the victim, usually

(Continued on page 22)

DEATH VALLEY TOLL ROAD NOW FREE. Scenes on the famous Eichbaum Road recently purchased by the State. 1—View on section leading from Argus Range across Panamint Valley to Panamint Mountains in distance. 2—Leading from Townsend Pass into Death Valley, Funeral Range in the distance. 3—West entrance to toll road through Argus Mountains. 4—Crossing the Panamints. 5—In Townsend Pass.

State Completes N. R. A. Project on Sloat Boulevard in San Francisco

By **COL. JNO. H. SKEGGS,** District Engineer

INCLUDED in the 1933-35 budget allotment under major project allocation for construction and improvement of highways in incorporated cities, was a group of projects on Federal aid connections on Routes 2 and 68 in San Francisco.

An important member of the group was Sloat Boulevard, between the Great Highway and Skyline Boulevard, Route 55, and Nineteenth Avenue, Route 56. Sloat Boulevard ties in these two important outlets down the Peninsula with Routes 2 and 68 and into the city via city streets and boulevards with the major bridge projects now in course of construction.

The existing road was one of the first boulevard improvements made by the city of San Francisco over twenty years ago, and consisted of two 30-foot strips of concrete surfaced with asphalt, one on each side of a 35-foot unpaved private right of way of the Market Street Railway Company.

TRAFFIC COMPELLED IMPROVEMENT

As a main thoroughfare from the city to the beach, it was heavily traveled and the poor condition of the surface, together with the rapid building up of adjacent lands due to opening up of a large tract on the south, demanded improvement of surface and width, and also alignment between 39th and 44th Avenues where a sharp reverse curve was very hazardous.

As this project was financed principally from NRA funds, the Division of Highways advertised the project, using plans prepared by the city of San Francisco, and a local firm of contractors, being low bidders on the job, did the work under State supervision.

The right of way is 135 feet wide. Curbs were set back 8 feet on each side, reducing sidewalks from 20 feet to 12 feet. The 8-foot strips were paved with 8 inches of Portland cement concrete and the existing 30-foot strips were resurfaced with asphalt concrete with a minimum thickness of 2 inches.

LIGHTING SYSTEM MOVED

A complete lighting system had to be moved back to new lines, and a concrete bridge over a city boulevard between 36th and 37th Avenues was widened. A considerable amount of sewer, sidewalk, and ornamental shrubbery adjustment was required.

Major contract items involved were: roadway excavation, 5103 cubic yards; crusher run base, 2606 cubic yards; asphalt concrete leveling and surface courses, 13,782 tons, and class "A" Portland cement concrete, 2900 cubic yards. The total cost, exclusive of engineering, was $109,474.

The Portland cement concrete was dry-mixed at the aggregate plant and wet-mixed with a one-yard paver on the road. Concrete curbs and sidewalks were made with plant-mixed, transit agitated concrete. Asphalt concrete was finished with a 30-foot adapted paving machine, a surface roughness of slightly over 14 inches per mile being obtained.

CURVES ELIMINATED

The adjustment of alignment between 39th Avenue and 44th Avenue, where reverse curves of 1450 foot and 185 foot radii existed, was necessary to eliminate the dangerous condition at this location. The portion on 1450 foot radius was paved, and the portion on the new radius of 1500 feet, replacing the old 185 foot curve, is to be constructed by the city of San Francisco from its share of the one-quarter cent gas tax fund allocated to cities.

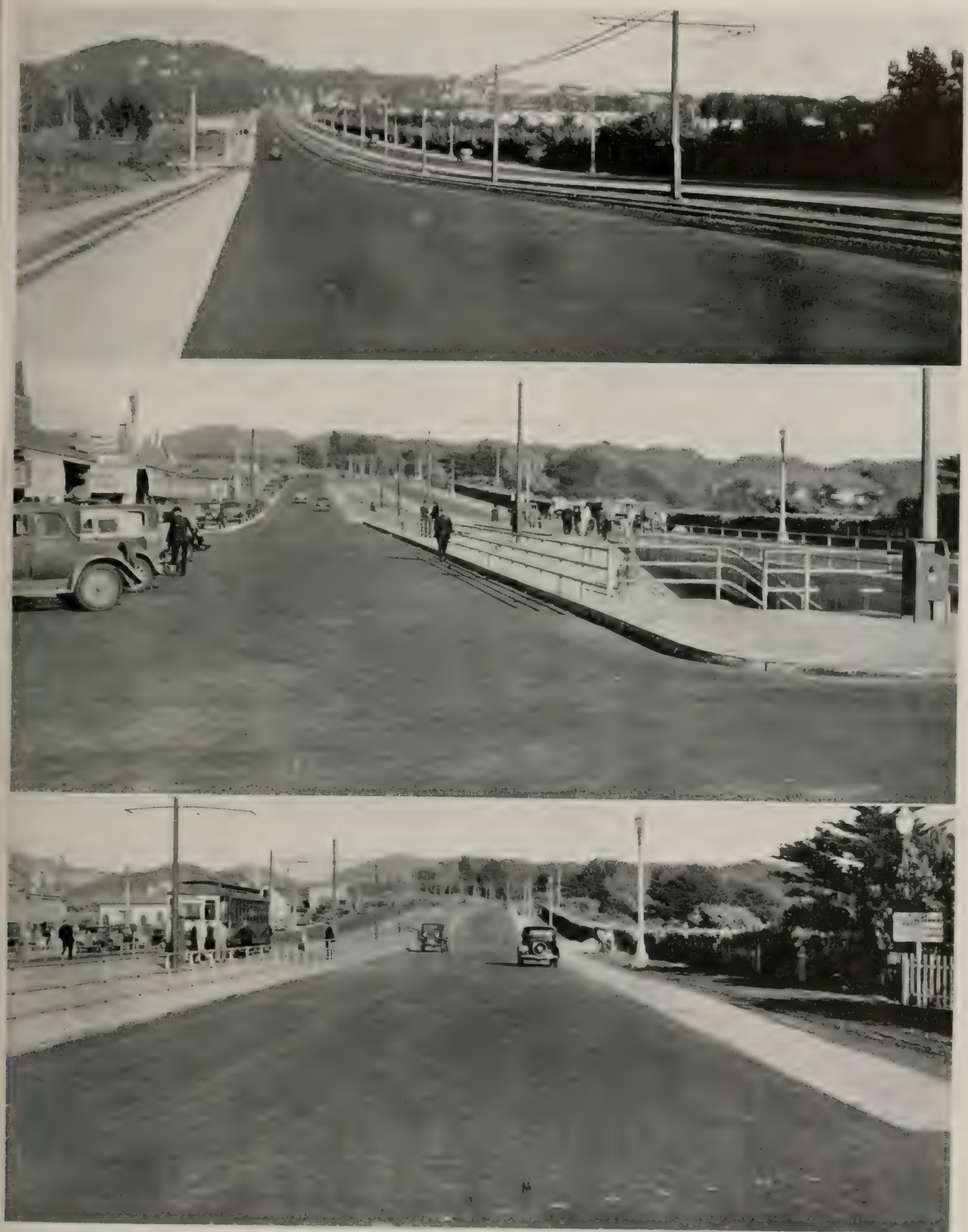
As a result of the work thus accomplished the new road is a splendid specimen of wide, smooth highway constructed on modern lines, and well fits this important boulevard link in the State Highway System.

ROMANS SIGNPOSTED HIGHWAYS

History records the fact that the ancient Romans signposted the Appian Way 2000 years ago. Some 20 centuries back, engineers of the Roman Empire placed a milestone every 1000 paces along the highways. Beyond 100 miles from Rome and in the provinces, these markers indicated the distance to the nearest principal town. The Appian Way is still traveled today.

Judge: "So your matrimonial life has been very unhappy! What was the trouble? Was it December married to May?"

Chloe Johnson: "Lan' sakes, no, jedge; it was Labor Day wedded to de Day of Rest."



SLOAT BOULEVARD IMPROVEMENT: 1—At top, general view showing 135 foot right of way with one-way traffic on either side of trolley tracks in the center. 2—North side of highway at point opposite Fleishhacker Zoo and pool showing subway entrance to Municipal Beach. 3—South side of Sloat Boulevard Improvement at Beach Subway opposite entrance to Fleishhacker Pool.

Zoning for Control of Building Along the California State Highway System

At the request of the American Association of State Highway Officials, the following article was prepared by Mr. C. C. Carleton as a paper to be read at the recent annual convention of the association in Santa Fe, New Mexico. It proved an outstanding paper that attracted widespread interest and comment and is presented here in its entirety with exception of the minor deletion of a report summarized in the context.

By **C. C. CARLETON**, Chief, Division of Contracts and Rights of Way

THE SCOPE of this paper will be confined to zoning and other regulatory procedure designed to contribute to the usefulness and attractiveness of roads and roadside settings. The writer was requested to relate his own experience with the legal problem of the control of roadside uses in connection with the development of the highway system of California, which further limits its range.

California has figured to a considerable extent in the evolution of anti-nuisance laws into our modern zoning legislation.* In several early California decisions relating to Chinese laundries the germ of the zoning idea was found and about that time there appeared ordinances restricting certain uses to certain districts and declaring that a business carried on in a district where that particular use was prohibited should be considered a nuisance.

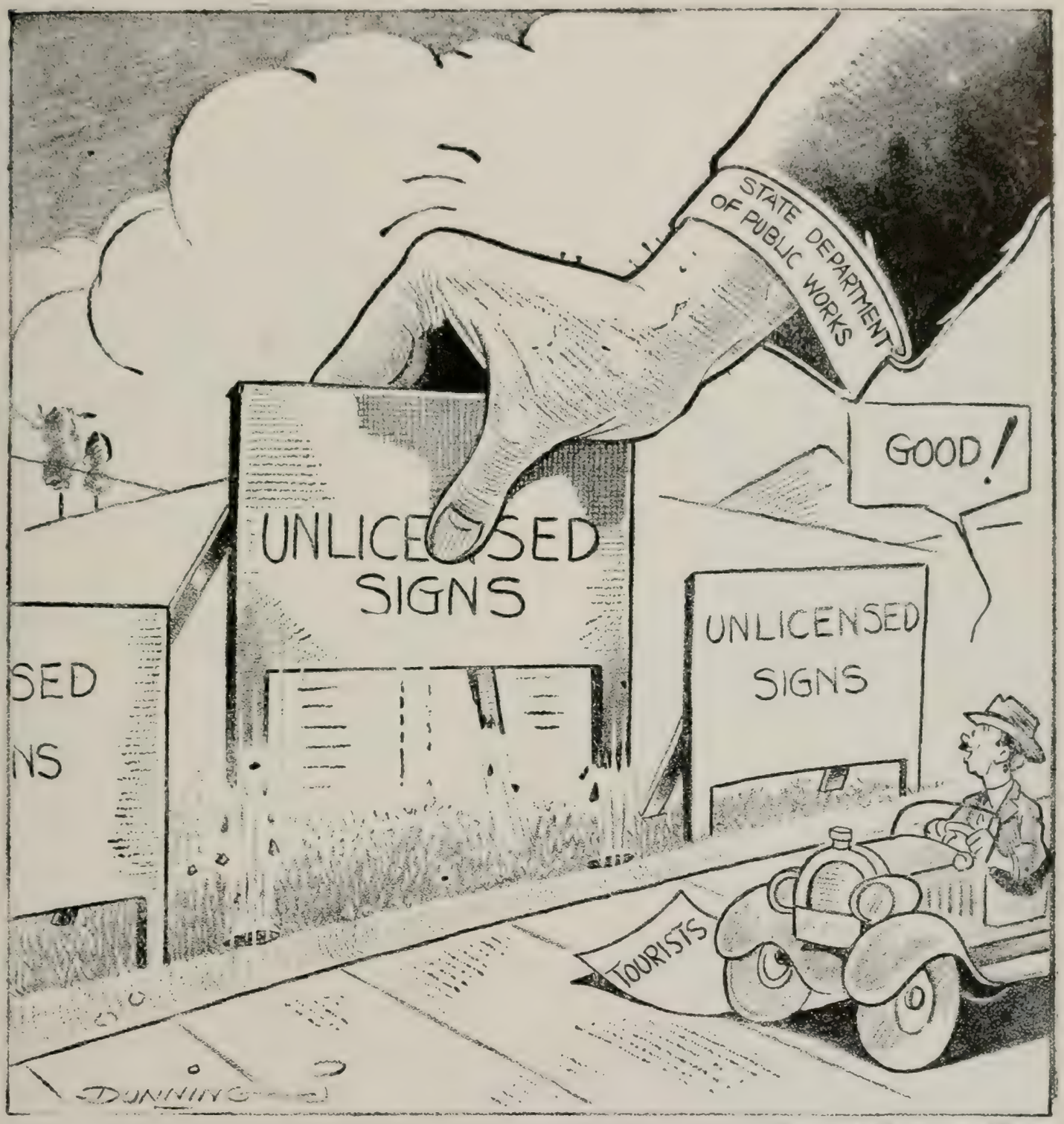
In 1885 the city of Modesto passed the first municipal zoning or districting ordinance in the State. This related to the laundry business also and the constitutionality of the ordinance was upheld by the State Supreme Court. (*In re Hang Kie,* 69 Cal. 149.)

C. C. CARLETON

There followed many city ordinances which have been sustained in a long line of California cases establishing the right of municipal authorities to restrict practically any kind of business, the operation of which might be a menace, harming public safety, sanitation or morals, or the public generally, within city boundaries. Prior to the hearing of the leading case of *Village of Euclid* vs. *Ambler Realty Company,* 272 U. S. 365, decided in 1926, and in which the principle of comprehensive zoning was sustained by the Supreme Court of the United States, two important decisions had been rendered by the California Supreme Court upholding the right of a city to establish and maintain residential districts under a comprehensive zoning scheme or plan, advancing many reasons in support of the zoning program and recognizing the idea that changed conditions called for changing laws. In one of these cases (*Miller* vs. *Board of Public Works,* 195 Cal. 477), zoning is succinctly defined as follows:

* See "Zoning in the United States." Edited by W. L. Pollard, Los Angeles.

YANK THEM UP!



Courtesy of Sacramento Union

ZONING DEFINED

"In its original and primary sense, zoning is simply the division of a city into districts and the prescription and application of different regulations in each district when regulations are divided into two classes: (1) Those which regulate the height or bulk of buildings within certain designated districts, in other words, those regulations which have to do with structural and architectural designs of the buildings; and (2) those which prescribe the use to which buildings within certain designated districts may be put."

The celebrated Euclid Village, Ohio, case demonstrating the friendly attitude of the United States Supreme Court toward comprehensive urban zoning was the first encouragement to our State highway authorities that zoning might some day be a potent force in the protection of the scenic values of public highways.

During the eight years which have passed since that memorable decision considerable progress has been made in California in expanding zoning legislation to regulate situations outside of city limits, and more specifically, to bring about effective roadside control.

SLOW PROGRESS MADE

Many millions of dollars were being expended in the construction of modern highways throughout the State, but despite numberless conferences of earnest, public spirited citizens and organizations interested in the aesthetic phases of highway development, slow

(Continued on page 16)

Hornitos, "Ghost" Town Without a City Official, Gets $70 Gasoline Tax Share

By **R. E. PIERCE,** District Engineer, District X

HORNITOS, another of the near "ghost" towns, in Mariposa County, occupies a rather unique status among California cities. This town and the town of San Joaquin, in Fresno County, are the only incorporated cities in the State having no officials.

Hornitos enjoys the further distinction of being the only incorporated city in Mariposa County, and also the only incorporated city in District X not on a State highway. Yet the city is entitled to a share of the ¼-cent gasoline tax and the dearth of officials was discovered when the Division of Highways sought to arrange payment to the city.

The town of Hornitos was first incorporated by act of the Legislature approved April 8, 1861. The act was repealed by the statute approved March 19, 1868, and two years later the town was reincorporated by act of the Legislature approved March 29, 1870.

ONCE HAD TRUSTEES

The statute provided that the officers should consist of three trustees constituting a board of trustees, one trustee to be elected as president, one as treasurer, and one as clerk. The trustees were elected annually and the compensation was fixed at $1.00 per annum. But no trustees hold office today.

Hornitos, Spanish for "Little Ovens," retains the original buildings, in practically the same condition as during the mining days. One of these is the Masonic lodge building where meetings are still held.

According to tradition, the famous bandit Joaquin Murietta here made his escape from a posse by using a tunnel under the main street, passing from a building on one side of the street to the ruins of another on the opposite side of the street. The tunnel is still in good condition and the building is still standing.

In Hornitos is a plaza, unique among California mining towns, and probably due to the early Spanish influence.

RUINS TO BE PRESERVED

A building, now in ruins, housed the mercantile establishment of Ghirardelli, since famous as a chocolate manufacturer in San Francisco. This building site has been purchased by the Ghirardelli heirs, and will be preserved by them.

Mr. Cavagnaro, who was born and raised in Hornitos and who runs a store which has been in operation since early mining days, states that one of the principal reasons for the decline of Hornitos was the advent of the railroad. Freight originally coming by team from Stockton, for distribution through the southern mines area, was diverted to the railroad, reducing the business of the town.

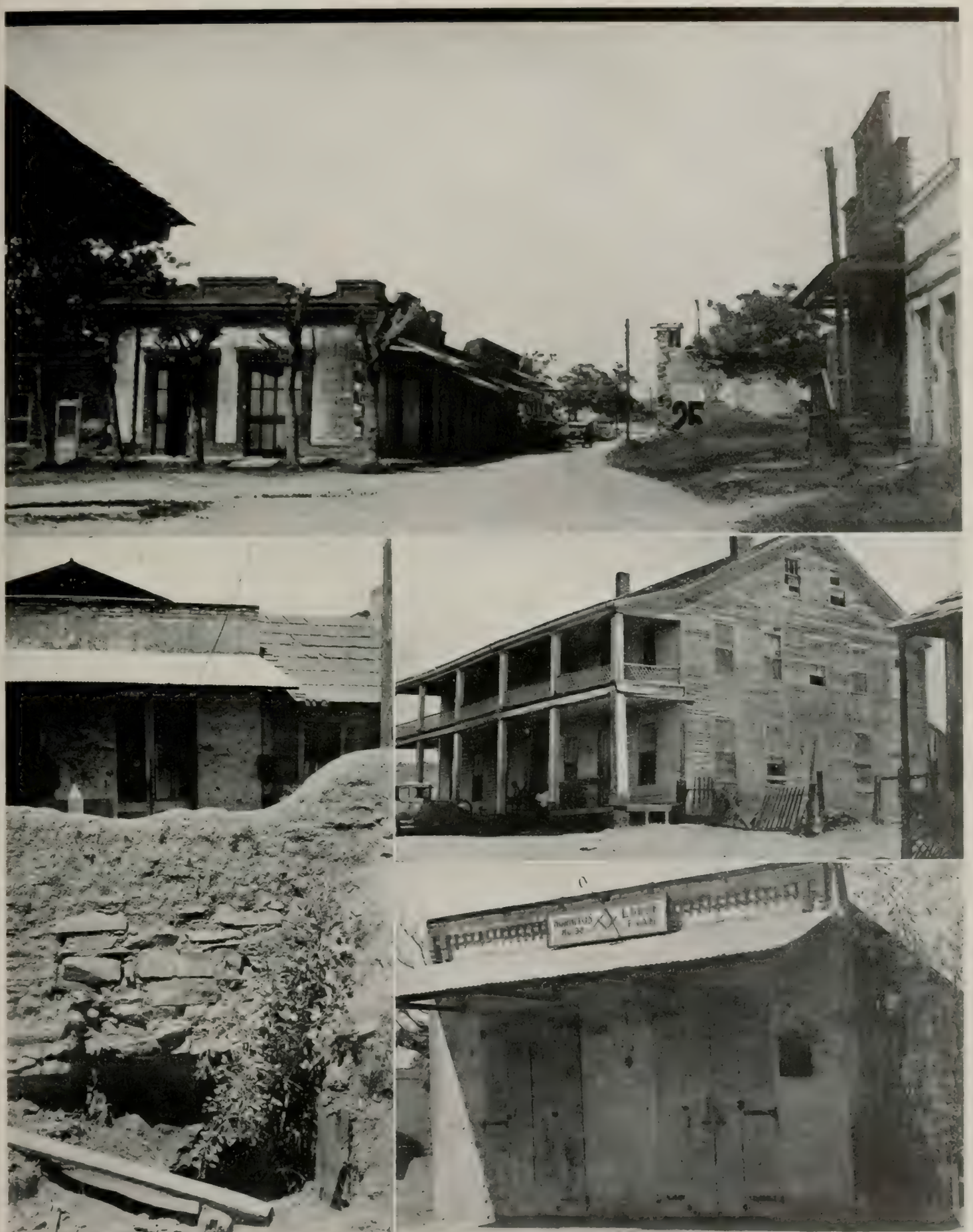
Owing to the fact that Hornitos is an incorporated city, and in spite of having no city government, the law entitles it to a share of the ¼-cent gasoline tax allocation, which, based upon the last Federal census, is estimated to amount to about $70 for the present biennium. As there are no city officials with whom to consult, it is proposed to expend the money for oiling the main street to eliminate the dust.

An automobile tour, inaugurated by the chambers of commerce of Mariposa and Turlock a short time ago for the purpose of booming the road from Turlock via Snelling, Merced Falls, and Hornitos to Mariposa, had a get-together luncheon at Bear Valley on the Mother Lode Highway. Considerable time was spend by the group who formed the caravan, in a tour of Hornitos, where the above interesting facts were related by J. W. Collins, county supervisor and lifelong resident of Hornitos and the immediate neighborhood.

ROAD CONSTRUCTION MAKING RAPID PROGRESS IN MEXICO

Under the stimulus of Federal Aid, road building in Mexico has taken long strides forward during the last year and a half, according to a recent U. S. Commerce department report. During 19 months up to August 1 last, construction in 23 Mexican states and two territories has resulted as follows: Dry season road, 1429 miles; all-season road (gravel surfaced), 574 miles; paved, 44.2 miles. Cost of the program to Federal and State governments (half by each) amounted to 11,500,000 pesos.

Too many 20-mile-an-hour minds are driving autos at a 60-mile clip.—*The Safe Driver.*



HORNITOS (LITTLE OVENS), once a hot town of the Mother Lode country and a hideout of the famous bandit, Joaquin Murietta, is now a very ghostly "ghost city." The top picture shows a bit of the town plaza in the foreground and a view along the main street lined with ruins of once busy mercantile establishments and homes. There is a tunnel under this street said to have been used by Murietta in escaping from possemen who had cornered him in a house. House and tunnel are shown at lower left. The big hotel where General Grant once stopped and the old Masonic Lodge building, still used, are also shown.

Gas Tax Continues Down Trend. Loss of $664,597 for November

CONTINUING a decline that began early in the summer the California gasoline tax for November shows a loss of $664,597 compared with November of 1933.

In spite of the ideal weather conditions, improved roads and normal summer and fall prices, sales of gasoline have been decreasing steadily since May of last year with the exception of the month of October, which showed an increase of $240,039. Assessments levied by the Board of Equalization show the following decreases as compared with the corresponding months of 1933:

June	$269,643
July	323,239
August	157,350
September	161,328
November	664,597
Total decrease	$1,576,157

The assessments for November showed the sharpest rate of decrease experienced thus far in the assessments for the calendar year 1934. The total assessment was $3,227,105.78 as compared with $3,891,703.17 for November of 1933, a decrease of $664,597.39 or 17.07 per cent. With only the returns for December to come it appears that the total assessments for 1934 will fall slightly below the figure for 1933 with a probable total for the year of $39,000,000.

Approximately 10 per cent of the gross assessments are required to make legal refunds and to cover collection expense so that the net revenue from the gas tax for 1934 will probably be slightly under $36,000,000. Of this amount the proceeds of one cent or $12,000,000 goes to the counties for roads and streets and the remainder is allocated to the Division of Highways for maintaining and constructing State highways with the reservation, however, that the equivalent of one-fourth cent or approximately $3,000,000 be expended on roads and streets within municipalities.

Food for Thought

California has developed a State highway system of remarkable excellence. This State boasts some of the best roadways in the United States or in the world. The values of these improved highways and the benefits which they bestow upon the State should be considered carefully by all.—*Porterville Recorder.*

80 Mile Three-lane Highway Will Link L. A. and San Joaquin

THE completion within the next six months of the north section relocation of the Ridge Route through Grapevine Canyon in Kern County will give the State highway system a three-lane pavement all the way from Los Angeles to San Joaquin Valley, a distance of 80 miles, with the exception of a five mile gap between Fort Tejon and the Los Angeles County line. Provision for the completion of the construction of this gap is made in the next biennial budget.

In the construction of the 5.22 miles now under contract between Fort Tejon and a point one mile north of Grapevine Station, the first 3.7 miles was entirely completed with its 30 foot Portland cement concrete pavement last October. This section eliminated the famous Grapevine Grade with its series of dangerous hairpin curves that long impeded traffic between Los Angeles and San Joaquin Valley.

The contractors have already moved more than half of the 375,000 yards of dirt that must be handled in grading the remaining 1.5 miles and are expected to finish paving by next July.

In spite of the fact that this very heavy grading work crosses and recrosses the existing pavement there is no interference to traffic because of a very complete system of detour roads that has been provided.

All detours are surfaced with oil treated rock mixed in an asphaltic concrete plant, before any traffic goes on the detour. At the conclusion of the contract this surfacing rock will be used in the construction of shoulders along the pavement.

GAS TAX EVADER PUNISHED

The first test of Indiana's gasoline tax law, which provides punishment under the embezzlement statute for failure to return to the State the gasoline taxes collected from motorists, has resulted in conviction of one offender and a maximum sentence of from one to five years imprisonment and a fine of $500.

The State charged him with having failed to pay $318.08 in gasoline taxes which he allegedly collected from motorists during the month of August, 1933. A circuit court jury recommended imposition of the full legal penalty.

She—And you'd rather stay here with me than go to that gala occasion at the Ritzmore?

He—Why certainly. You're equal to any occasion.

NO "DEATH CURVES" HERE. Views of the completed 3½ mile improvement of the northern section of the famous Ridge Route show that the former dangerous curves and narrow roadway have been replaced by a fine, safe three-lane modern highway. This canyon, which is the main pass between Los Angeles and the San Joaquin Valley, carries not only the State Highway, but also transmission lines of two power companies, three gas pipelines from Kettleman Hills to Los Angeles and pipelines of two large oil companies. All these utilities had to be constructed and rearranged to avoid interference with the new highway.

1235 Bridge Structures Taken Over

(Continued from page 2)

money for reconstructing the bridge is limited or not available.

MANY FACTORS INVOLVED

Very often minor repairs can be made to the structure at a relatively small cost which will permit a higher load limit. It will thus be seen that the final decision is the result of a consideration of many factors such as the most economical procedure, the available finances and the minimum of inconvenience and risk to the traveling public.

Of course, it is practically impossible for any investigator to know exactly what value can be placed on the strength of the various materials in a bridge structure, especially after a long period of use under unfavorable or unknown conditions. Decision, therefore, must be based largely on previous experience with materials under somewhat similar conditions, and judgment must decide between a load limit which will assure the safety of the bridge and still not place undue restrictions on the traffic which is using the road.

WHY BRIDGES ARE POSTED

Very often a bridge posted for a certain load limit will have carried a much heavier load in the past, but on the other hand, bridges have failed under lighter loads than have been regularly using them. Very often unusual local roughness of surface may cause heavy impact or set up an unusual amount of vibration and this will result in a failure which would not have occurred otherwise even under a much heavier load. Such facts must be taken into consideration when posting bridges.

Following an act of the 1933 Legislature, the highway mileage was increased about 6780 miles beginning August, 1933, which added a very large number of low standard structures to the State highway system. Due to conditions connected with the general depression which preceded the taking over of the bridges, the counties had cut their expenditures for maintenance to a minimum, so that in many cases it was necessary for the highway department to act immediately, in order to prevent accidents from structural failures.

On a total of approximately 14,135 miles of State highways there are about 3450 bridges and grade separations, of which 1235 were taken over with the highways that were added in August, 1933. It may also be of interest to state that there are a total of 1155 grade crossings on the highway system, 605 of which were acquired in August, 1933. These crossings require considerable investigation and study in order to reduce the hazard they produce which may be done by improving the local line and grade, increasing the protection, or by constructing a grade separation. At least 30 per cent of the bridges acquired from the counties were in such a condition that immediate repairs and improvements were found to be necessary.

Lacking finances to do this, the alternative was to post them for a reduced load limit. An example of a large bridge too weak for legal loads, and in fact a matter of deep concern under any kind of traffic, is shown in the photo of the bridge over Jughandle Creek, a deep ravine on the Mendocino Coast Highway. Rebuilding or even making major repairs to such bridges can not be accomplished at this time as all available funds have been budgeted to necessary specific projects.

SERIOUS PROBLEM PRESENTED

Just what to do with these structures until reconstruction funds become available calls for considerable thought and concern on the part of those charged with their safety. There are also innumerable small bridges, usually of the timber trestle type, which need immediate repairs or improvements and even though the structures are small, their hazards are very real and it is desirable in many cases to either rebuild or materially remodel them. While such structures are individually small, the total amount of funds required for the necessary work on all of them is rather formidable.

However, since the legislative act of 1933, we have engaged in temporary repairs to inadequate structures included in this additional State highway mileage and it will be our endeavor to continue this work commensurate with available funds. Even with the expenditure of funds as provided there will remain a large number of structures which must be posted for a reduced legal load limit.

(Continued on page 18)

TYPICAL OF BRIDGE DETERIORATION to the danger point when taken into the secondary system was the high span across Jughandle Cre ek on the Mendocino shoreline coast road shown in the three top pictures. It was a combination wood and steel deck truss structure with bad approach alignment and wooden roadway shown in Nos. 4 and 5. No. 3 is a closeup of one of the lower chord joints seriously weakened by rusting of the metal. The State has made temporary repairs by adding strengthening supports. Pictures 1 and 2 show the old timber trestle on Route 101 between Dixon and the Rio Vista-Fairfield road before and after being taken over by the State.

California Planning Act Passed in '29

(Continued from page 9)

progress was being made in protecting roadside beauty.

About the only accomplishments in this behalf prior to the passage of the California Planning Act of 1929 were those which were voluntary in their nature. For example, the activity of the Save-the-Redwoods League and the Redwood Empire Association, which resulted in the preservation of the giant redwoods along the now renowned Redwood Highway in northwestern California.

Ugly and ramshackle refreshment stands, auto camps, service stations, auto wrecking yards, and other structures of a commercial nature, sprang up along the newly improved highways, which not only detracted from the full enjoyment of the use of the thoroughfares by the traveling public but, through their overbuilding and unsightliness, caused resultant loss of business to their proprietors. Advertising signs spread like the "lice of Egypt."

LEGISLATIVE ACT PASSED

The writer will undertake briefly to report the progress that has been made in the past five years to promote greater roadside beauty and more beneficial use of the adjacent property itself.

Five years ago, as the result of the efforts of those forward looking enthusiasts interested in adequate planning and zoning procedure and to remedy unpleasing and unprofitable conditions outside of as well as inside of municipalities, the Legislature passed the California Planning Act (Act 5211b, Deering's General Laws of California).

This act provided the means of effectuating in the planning field the right to the full exercise of the police power which California counties possess. California, desiring that full local authority should be exercised by the municipalities and the political subdivisions of the State, embodied this principle in her present Constitution upon its adoption in 1879 in the following language:

"Any county, city, town, or township may make and enforce within its limits all such local, police, sanitary and other regulations as are not in conflict with general laws."

PLANNING COMMISSIONS AUTHORIZED

The California Planning Act provides that any city, city and county, or county, may adopt and establish an official master plan of said city, city and county, or county. Such plan is declared by the act to be established to conserve and promote the public health, safety and general welfare.

The legislative body of each city, or city and county, may, and of each county shall, create a planning commission.

It may be stated here that the Legislature of California has not delegated zoning powers to the State highway authorities, themselves, but these authorities collaborate in the affairs of the city and county planning commissions where State highway planning and beautification are involved. The result has been a more intelligent correlation of local and State highways, the fostering of a spirit of mutual helpfulness in road and county matters in various political units, the increase of community amenities and an added impetus to the vitally important planning commission idea itself.

The principal problems involved have been the development of plans for an efficient system of roads which will adequately serve both through and local traffic, and which will combine safety and attractiveness with service.

REGIONAL PLANNING DISTRICTS

The California Planning Act also authorizes the formation of regional planning districts and the creation for such districts of regional planning commissions. Any regional planning district may include both incorporated and unincorporated territory and may include all or portions of one or more counties, but it must include all of any regular county voting precinct, any portion of which precinct it includes; except that no regional planning district shall be formed for territory consisting of all of one county only. The powers and duties of any such regional planning commission correspond to those provided for city and county planning commissions.

The California Planning Act further requires that the procedure set up in the Zoning Enabling Act (Act 994, Deering's General Laws of California) for cities shall be used in zoning. Thus is defined the manner of exercising in zoning the police power constitutionally residing in all counties of the State.

The function of the planning commission is to make all necessary studies, to prepare the zoning plan and conduct hearings thereon, and to recommend the plan to the board of supervisors. The planning commission has no independent authority, being purely advisory.

PROTECTING SCENIC VALUE

While county zoning has been based thus far largely upon the same principles as zoning by a city government, county zoning has the opportunity of a broader application than city zoning.

A number of municipal and county zoning and building setback ordinances have now been adopted for the purpose of protecting scenic values and to regulate the uses of land adjacent to traffic thoroughfares.

Mr. Hugh Pomeroy, a well known planning authority, states, "The latter two, standing alone, might be considered as encroaching too far upon the still largely forbidden domain of regulation for aesthetic purposes; but with the background of a functional analysis of the entire county, in regard to which they are formulated, they assume a definite and broader relationship to the public welfare."

INVOLVES SIGN CONTROL

The same authority states "Regulation of the uses of land adjacent to highways might appear to be 'ribbon' zoning; but related to a county land use plan, it becomes part of a comprehensive whole. * * *"

County zoning in this broader application may be the means of solving the increasingly vexing

Zoning Decisions Show Judicial Drift

(Continued from preceding page)

problem faced by this motor vehicle age in the condition whereby roadside signs prey upon the traffic of highways, and roadside commercial uses mire themselves in the slough of their own unattractiveness.

The California Planning Act gives to the counties of California the means of using in the field of zoning the police power with which they are vested. Thereby a major land use plan of the county may provide the background for zoning, for those regulatory measures which involve the public welfare in the protection of scenic areas and in the regulation of roadside land uses, and for the application of standards of subdivision control consistent with the type of area involved. And thereby a functional analysis of the county may guide the design of the entire county plan.

Some statements concerning zoning made by the court in the rather recent California case of *Smith* vs. *Collison* (119 Cal. App. 180) may be of interest as indicating the present-day drift of judicial thought in this State:

"Zoning is the division into districts of certain areas with regulatory prescription applied to the land or buildings. The regulations must have reference to and be in the interest of the public, such as the preservation of the peace, safety, morals, health, comfort and convenience of the public generally. Comprehensive zoning is regulation with forethought to a uniform plan or design to restrict construction and development reasonably and with fairness to each district within the jurisdiction of the duly empowered legislative body.

Changing conditions necessitate changed regulations. A comprehensive plan of zoning does not mean permanent regulation. Extensions, curtailments and modifications are all a part of comprehensive zoning. A zoning plan can not be made in a day. Emergency enactments and prior regulatory measures are as much a part of a comprehensive plan as if embodied in the general zoning law provided that they were duly and regularly passed by a legislative body in contemplation of a general zoning law and prove to be reasonably related to the general plan and for the better welfare of the public. To hold otherwise would result in assisting evaders of a contemplated uniform zoning plan to destroy the very purpose of its enactment.

Zoning is inherent in the police power. The doctrine of comprehensive zoning has been sustained by the Supreme Court of this State, but when there has been an arbitrary and discriminatory exercise of police power, or when the ordinance in question has no relation to public health, general welfare or safety, morals or protection of the community, or where there is an unreasonable restriction, the courts will interfere."

Quite noteworthy has been the progress of marginal zoning along California's thoroughfares, resulting in the advancement of the best interests both of the adjacent property and of the use and appearance of the protected highways.

The police power is being invoked to deal with some of the problems arising from the profound change in conditions of rural life resulting from the motorization of travel which has reached its present extent largely within the past decade. Land uses in rural areas bear a distinctly different relationship to the public welfare when they take their character from streams of traffic which is extraneous in origin to the rural area than when they derive it from purely rural conditions.

MARGINAL LAND USES

The claim that the police power is distinctly limited in its application in rural areas as distinguished from urban areas does not apply in the consideration of highway marginal uses. The marginal land uses which are proposed to be regulated along a highway through a rural area are uses arising almost solely because of the existence of traffic on the highway. There is thus set up along traffic thoroughfares a land use condition which is a distinct phase of the entire regional land use structure.

The nature of this condition is far more nearly a projection of urban than a part of rural conditions. This fact is becoming generally recognized, not only in the planning function of government but in the entire field of legislation dealing with modern traffic and modern traffic thoroughfares.

The ordinances adopted in California have usually been backed by public sentiment and are being increasingly supported by public opinion. In addition, the owners of the property subject to the regulations are giving them increasing support. There is little evidence of a feeling that the regulations are unduly interfering with property rights, there apparently being recognition of the public interest which is involved, that is, that the use of property marginal to a highway is intimately related to the functioning of the highway.

NOW "SETTLED LAW"

The validity of urban zoning is now safely within that haven called "settled law." Roadside zoning is obviously for human betterment. That being so, it is easily predictable that courts will come to recognize its specific constitutionality just as definitely as they have urban zoning.

To use the words of the court in *People* vs. *Sterling*, 220 N. Y. Supp. 315, "We have reached the point in the development of the police power where an aesthetic purpose needs but little assistance from a practical one in order to withstand an attack on constitutional grounds." In *State* vs. *Houghton*, 144 Minn. 13, 176 N. W. 159, the court stated: "It is time that courts recognize the aesthetic as a factor in life. Beauty and fitness enhance values in public and private structures."

As was observed by the court in the case of *Perlmutter* vs. *Greene*, 259 N. Y. 327, upholding the action of the State Superintendent of Public Works of New York in erecting a screen in front of a billboard on abutting property at a dangerous curve, to

(Continued on page 19)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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ANOTHER U. S. WARNING

An article released for publication by the U. S. Department of Agriculture under date of December 28, 1934, reads as follows:

"Apportionment of $125,000,000 for Federal aid to the states in highway construction in the fiscal year beginning July 1, 1935, marked the resumption of the old policy of Federal highway aid. The apportionment was made by Henry A. Wallace, Secretary of Agriculture, on December 27 under the authorization contained in the Hayden-Cartwright Act of June 18, 1934.

"Secretary Wallace, in making the apportionment, called attention to the possibility of reduction of a State's apportionment through the operation of the provision in the Hayden-Cartwright Act relative to the diversion of gasoline taxes and other taxes on motorists. The act provides that Federal aid for a State's highway shall be reduced unless the State uses for highways at least the amounts provided by law on June 18, 1934, for that purpose from the State's gasoline and motor vehicle taxes and other special taxes on motor vehicle owners."

THE PROVISION OF THE HAYDEN-CARTWRIGHT ACT REFERRED TO FURTHER SAYS ANY DIVERSION OF GAS TAX REVENUES FOR OTHER THAN ROAD PURPOSES SUBJECTS THE STATE TO A LOSS OF ONE-THIRD OF FEDERAL AID FUNDS WHICH IN THE CASE OF CALIFORNIA WOULD MEAN A LOSS OF APPROXIMATELY THREE MILLION DOLLARS FOR THE NEXT BIENNIUM.

"I only say what I know."
"Ah, one of those big, strong, silent men!"

12,500 R.R. Crossings at Grade on State Highway System

(Continued from page 14)

A rough estimate of the funds needed to replace or reconstruct all bridges on the State highway system that are below the standard required for safely carrying legal loads is around $3,000,000. To bring the condition of all bridges on the State system up to modern standards of strength and serviceability for traffic would require an expenditure in the neighborhood of $10,000,000, depending, of course, on the amount of relocation necessary to conform to final highway location and alignment.

12,500 GRADE CROSSINGS

This does not include the large number of cases on new highway construction or where reasonably satisfactory structures have to be abandoned on account of reconstructing the highways on proper alignment which the existing bridge locations will not fit.

In the case of railroad grade crossing separations, the amount of money that would be spent in separating the 12,500-odd crossings is a matter of several hundreds of millions of dollars for construction costs alone.

When the new secondary highways were taken over in August, 1933, it was soon evident that the necessary funds and an organization would have to be set up to investigate all the bridge structures on these roads, and to recommend repairs or maximum safe load limits for posting.

As the mileage of the highway system increases, with no increase in funds for State highway purposes, the cost of maintenance and minor improvements also rises and less money is, therefore, available for new construction. If additional funds are not available for new construction, and it is necessary to maintain the old structures in use, it then becomes more imperative that the work of checking the condition of existing low standard structures be carried on to assure their safety and to maintain them to the limit of their service life.

Customer—I am returning this barometer; it seems to be out of order.

Shopkeeper—What is the trouble, madam?

Customer—One day it says one thing, and the next day it says something altogether different!

In the good old-fashioned days, muses Robert, a felon was something a carpenter had on his thumb.

Outdoor Advertising Act Upheld

(Continued from page 17)

prevent the attention of motorists from being diverted from the road. "Beauty may not be Queen, but she is not an outcast beyond the pale of protection or respect. She may at least shelter herself under the wing of safety, morality or decency." (See *Arthur* vs. *Virkler*, 258 N. Y. Supp. 886, citing the Perlmutter case and defining "Aesthetics"; also, Annotation on Zoning, 86 A. L. R. 659; also *State* vs. *Kierman*, 88 A. L. R. 962.)

SIGN CONTROL RECOGNIZED

It is reassuring that the fundamental law to pass statutes and ordinances to regulate and restrict billboards and land uses under the police powers was expressly recognized by Justice Roberts in the opinion of the United States Supreme Court in the New York Milk Law case decided this year. (291 U. S. 502.) To quote Justice Roberts:

"The court has repeatedly sustained curtailment of enjoyment of private property, in the public interest. The owner's rights may be subordinated to the needs of other private owners whose pursuits are vital to the paramount interests of the community.

The State may control the use of property in various ways; may prohibit advertising billboards except of a prescribed size and location, or their use for certain kinds of advertising; may in certain circumstances authorize encroachments by party walls in cities; may fix the height of buildings, the character of materials, and methods of construction, the adjoining area which must be left open, and may exclude from residential sections offensive trades, industries, and structures likely injuriously to affect the public health or safety; or may establish zones within which certain types of buildings or businesses are permitted and others excluded."

LEGISLATIVE COMMITTEE APPOINTED

The Legislature of California at its session of 1929 appointed a Joint Assembly and Senate Committee on the Scenic Preservation of State Highways to investigate and make recommendations concerning the possibility of regulating and controlling the locations and standards of construction of gasoline stations, hot dog stands, advertising signs and other structures of a commercial nature along scenic roads and highways, and such committee duly made its report to the 1931 Legislature. * * *

This special study was the forerunner of the action of the 1933 Legislature in passing the comprehensive Outdoor Advertising Act (Chapter 341, Stats. Cal., 1933).

This act regulates and licenses outdoor advertising signs and structures outside of the limits of incorporated cities.

All signs or structures, with certain exceptions, within 300 feet of intersections are prohibited, as well as all signs and structures that are in an unsafe condition, in drainage channels, or obstructing the view of approaching vehicles for a distance of 500 feet. The act provides that any signs or structures that come within the above violations are public nuisances, and according to the wording of the Civil Code of California, no notice is necessary for the removal of public nuisances. However, in view of the fact that the act provides for a ten days' notice to the owner of the property upon which violations exist, this procedure is being followed. In May, 1934, Judge Fitzpatrick of the Superior Court of the City and County of San Francisco, decided that the Outdoor Advertising Act is constitutional.

CONSTITUTIONALITY UPHELD

The act was attacked in court by an outdoor advertising company, alleging that the act was unconstitutional on the ground that it imposes double taxation and deprives persons of their property without due process of law. Both of these points were held to be untenable. An appeal is now pending from the decision of the lower court.

In rendering the decision, Judge Fitzpatrick dissolved the restraining order placed upon the Department of Public Works against the enforcement of the provisions of the Outdoor Advertising Act. Therefore, the decision now permits its full enforcement and a campaign is under way whereby about four thousand nonconforming signs are being removed from private property. The act protects the public officials in entering upon private property to remove illegal signs by the following provision:

"For the purpose of removing or destroying any advertising structure or sign placed or maintained in violation of the provisions of this act, the director or his authorized agent may enter upon private property without incurring any liability therefor."

Recognizing local zoning ordinances, the Outdoor Advertising Act further provides:

"It is the intention of the Legislature to occupy the whole field of such regulation by the provisions of this act; provided, however, that nothing in this act shall be deemed to prohibit enforcement of any or all of the provisions hereof by persons designated so to act by appropriate ordinances duly adopted by any county of this State; provided, further, that nothing herein shall be deemed to prohibit the passage by any county of reasonable land use or zoning regulations affecting the placing and/or maintenance of advertising structures or signs in accordance with the provisions of Statutes of 1929, page 1805 (California Planning Act), or any amendment thereto."

EXERCISE OF POLICE POWER

California's planning act is an exercise of the police power to prescribe the designs of buildings or the use of property; its Outdoor Advertising Act is an exercise of the police power to regulate and license persons engaged in the business of outdoor advertising and all persons erecting or maintaining advertising signs and structures.

Through the medium of the legislation herein reviewed California is making very noticeable headway against tendencies which, had they been unarrested, would have much more seriously blemished the beauty of its thoroughfares and much more greatly diminished the desirability of the adjacent properties.

Bay Bridge Construction Progress Reported With Schedule for 1935

By **C. H. PURCELL**, Chief Engineer, San Francisco-Oakland Bay Bridge

THE following is a report on the progress of construction of the San Francisco-Oakland Bay Bridge for the years 1933 and 1934, together with a schedule of expected construction for 1935 and filed with Governor Frank F. Merriam by State Director of Public Works Earl Lee Kelly:

Progress of Construction

FROM GROUND BREAKING, JULY 9, 1933, TO JANUARY 1, 1935

	July 9 to December 31, 1933	January 1 to December 31, 1934
Money spent in construction	$6,000,000	$16,500,000
Concrete placed	110,000 cubic yards	440,000 cubic yards
San Francisco cable anchorage (concrete)	25% completed	50% completed
Anchorage steel	50% fabricated	All fabricated and 86% erected
Steel, West Bay towers	Fabrication of two towers started	Fabrication complete
Cable wire	25% drawn	84% drawn
East Bay steel superstructure		66% completed 65% delivered 60% fabricated 52% delivered 25% erected
Peak of men at work	2100	5953
Piers	1 complete and 12 under construction	49 completed
Yerba Buena Island tunnel	Appoach excavations completed	Three pilot tunnels bored full length and outer walls raised to full height. Concrete wall lining started
Yerba Buena anchorage	Excavation completed	Concrete complete ready for erection of steel cable bents
West Bay tower erection		Towers W-2, W-3, and W-6 erected. Tower W-5 25% erected
Concrete center anchorage	Caisson anchored at site	Under water work complete and superstructure raised to 207 feet above water
East Bay substructure	Six piers started	All piers (43) complete
Erection, East Bay superstructure		Thirteen 288-foot spans and six towers erected
Yerba Buena Island superstructure		One span erected

Schedule of Construction for 1935

The following is the schedule for completion of work during the year 1935 on the San Francisco-Oakland Bay Bridge:

San Francisco automobile approach ramps—
To be 65 per cent completed.

West Bay suspension bridge—
Catwalk to be started March 1.
Cable spinning to be started April 1.
Suspended structure, San Francisco to center anchorage, 50 per cent placed.
Cable spinning completed for twin suspension bridges during 1935.

Vehicular tunnel through island to be completed.

Viaduct over east side of island to be completed.

East Bay superstructure to be completed except for 576 feet of suspended span at center of 1400-foot cantilever span.

East Bay approaches to be 50 per cent completed.

Contracts to be let in 1935—
East Bay automobile distribution structure ramps and viaducts.
Cypress Street approach.
San Pablo Avenue crossing and approach.
Interurban Railway system construction.
Administration Building and Toll Plaza.
Bridge Lighting.

C. H. PURCELL

Son—Dad, did you ever meet a girl who combined the attributes of beauty, charm and intelligence?

Father—Yeah, but darn it, I sobered up the following morning.

AN IMPRESSIVE PREVIEW of a section of th e San Francisco-Oakland Bay Bridge just east of Yerba Buena Island, to be built during the first half of 1935, is presented in this drawing by Artist Nusé. A concrete viaduct extends from the tunnel mouth to a large concrete pier YB-1. Steel truss spans connect this pier with the huge concrete Anchor Pier E-1, that holds the anchor arm for the heavy cantilever span that will extend easterly from Pier E-2 shown at extreme right of picture.

Highway from U. S. to Panama Feasible

A highway more than 3200 miles long, connecting the southern boundary of the United States with the Panama Canal Zone and traversing Mexico and Central America, is pictured in engineering and economic terms in an official government report just issued under the title, "The Proposed Inter-American Highway," by the Bureau of Public Roads, U. S. Department of Agriculture.

The termini of the Inter-American highway are Nuevo Laredo in Mexico, just across the Rio Grande from Laredo, Texas, and Panama City, Republic of Panama. While the report describes the highway as "proposed," it is in fact already well on the way to realization, for of its total length approximately 40 per cent. is now open to year-round traffic and an additional 27 per cent is good or fair in dry weather. To establish connections between the sections of road already built and to modernize existing highway where necessary is the task confronting the five Central American republics, Panama, and Mexico.

SURVEYED BY GOVERNMENT

The Bureau of Public Roads report is based upon a careful reconnaissance survey in Central America, during which the American engineers covered hundreds of miles of territory. Extensive aerial photography helped the engineers select the most practicable route. That a through highway between the United States and Panama is "entirely feasible from an engineering point of view" is the conclusion of the engineers.

Making a fool of ourselves is only giving nature an encore.

Water Authority Gives Hyatt Instructions

At a meeting of the Water Project Authority of California recently held in Sacramento, the following resolutions were unanimously adopted.

"That the Executive Officer of the Water Project Authority, Edward Hyatt, be instructed and directed to devote as much of his time and attention in Washington, D. C., and elsewhere, as he may determine to be necessary for the purpose of securing early Federal assistance in financing the Central Valley Project."

"That the Authority believes the Central Valley Project Act to be fundamentally sound and workable and recommends no amendments except those necessary to comply with Federal requirements."

150,000 ROAD SIGNS IN SOUTH

More than 150,000 sign markers guide motorists on roads in the southland, according to a report from the Automobile Club of Southern California. These include half a hundred types, warning drivers of road dips, curves, crossings or other hazards, and giving distances and directions to nearest towns and principal destinations along routes at every crossroad.

"Did you know that I had taken up story-writing as a career?"

"No. Sold anything yet?"

"Yes; my watch, my saxophone and my overcoat."
—*Barksdale News.*

Death Valley Made More Accessible

(Continued from page 4)

weakened in condition, drinks their water without moderation.

The area of greatest general attraction, however, is the two parallel mountain ranges on the east and west sides of the valley floor, of comparatively recent formation. They rise precipitously from elevations actually below sea level to heights of considerably more than a mile of vertical upthrust. The ranges on the east, known as the Grapevine and Amargosa ranges, are built of layer upon layer of stratified rocks of many colors. This is particularly noticeable in the vicinity of Furnace Creek.

HIGH MOUNTAIN PEAKS

The Panamint Range on the west, while not so colorful in formation, shows the greater uplift, and contains a number of high and prominent peaks. among which Telescope Peak, with an elevation of 11,045 feet, dominates the entire range.

The terriffic erosion from thousands of years of local cloudbursts has honeycombed the valley facades with a continuous series of deep gorges and canyons of grotesquely beautiful formations and vivid colorings not surpassed in any other area. The alluvium has been carried down in a series of deltas or fans, some so steep as to be difficult of ascent and others sloping up gently on such moderate grades as to be easily traveled with an automobile.

Among those of the latter class are the fan at the mouth of Titus Canyon, over which the road to Scotty's Castle is constructed, and the Emigrant Wash, lying between Stovepipe Wells and Towne's Pass, through which the Eichbaum toll road is built, and through which a portion of the ill-fated Jayhawker party of emigrants, trapped on the valley floor in 1849, escaped to enter the equally great dangers of Panamint Sink.

The beds of evaporated salts and other minerals are of great depth, test holes having been sunk to 1000 feet below the floor of the valley and still being in salts. Although the valley is rich in many kinds of minerals, it is the extensive borax deposits which have so far given it a commercial importance.

50,000 VISITORS EXPECTED

Death Valley is rapidly coming into prominence and increasing numbers of visitors are attracted by the ideal winter climate, the many natural interests, and a certain amount of curiosity. It is estimated that 21,500 people entered the park during the winter season 1933–1934.

With the dissemination of information relative to road improvements being performed by the State Highway Department and National Park Service, 50,000 visitors can be expected during the coming season.

Well equipped hotels in different sections of the valley and on the approach roads provide accommodations and recreational advantages for tourist travel. The National Park Service has developed a public automobile camp near Furnace Creek, with modern conveniences, and they have also prepared and keep up simpler camps at Bennett's Wells, Triangle Springs, Mesquite Springs and Emigrant Springs. Water supplies have been developed at different points throughout the valley, either flowing or equipped with hand pumps.

UNIQUE SCENIC VIEW

In spite of the ruggedness of the mountains, there are several high points that can be reached by automobile, and the views from these points are unsurpassed, taking in the lowest point in America and at the same time the serrated, snow capped peak of Mt. Whitney, highest point in the United States. Many of the canyons that have been eroded through the mountain walls are easy of access by roads constructed up their beds, and contain many beautiful and interesting features.

The location of Death Valley makes it increasingly important as a traffic artery and through route to Las Vegas. Also, its easy accessibility to the Boulder Dam area makes it probable that with better road conditions, much of the Las Vegas recreational traffic will pass that way.

ROAD DEVELOPMENT PLANNED

Considerable improvement has already been made by two CCC camps established in the valley the past season, and by State maintenance forces, and at present there is a network of traversable roads in the valley aggregating 500 miles, all of which reach points of interest or are on some well established route. The National Park Service is now planning for the further development of the area, including the establishment of checking stations, dwellings, headquarters and museum buildings, improvement of camp grounds, and an extensive road program.

The approach roads to the east and west are under the State secondary system, placed there by legislative act in August, 1933. The year that has elapsed has witnessed extensive improvement, and with a continuation of the present program, the trip through the valley can be made with ease and even comfort.

The southeastern entrance via Baker and Shoshone is rapidly being brought to an excellent condition. To the west, the entrance over State Route 127 from Lone Pine via Keeler and Darwin is through many points of interest. The traveler passes along the shores of Owens Lake, now a dry bed of highly mineralized waste from which chemicals are obtained by the manufacturing plants at Keeler, but which in comparatively recent years was covered with crystal clear water through which plowed steamers of size, carrying lead and silver bullion like cordwood from the Cerro Gordo mine that still can be seen on the mountains to the northeast.

STRIKING VOLCANIC FEATURES

Through Darwin, a pioneer mining settlement, with its smelter and mines awaiting the return of prosperity, the traveler is taken through the Darwin Wash, where the action of nature's volcanic forces is seen on every hand. Passing near the Darwin Falls, the route descends over the old toll road to the Panamint Sink with its sand dunes and, under certain weather conditions, wierd mirages over the valley floor.

Climbing from Panamint Valley, the road winds its way through the forbidding Panamint Range and Emigrant Wash passing strikingly colorful formations as it descends to the floor of Death Valley.

Budget Loses $1,750,000 of Fee Funds

(Continued from page 1)

tion of the highway transportation tax, which has already been mentioned, will cut off about $750,000 for the biennial period. The provision to make all transfer fees available to the Department of Motor Vehicles causes a further reduction of about $1,000,000 for the biennium. Legislative enactment in 1933 providing for the pro rata support of General Fund departments, such as the Controller, Attorney General, Department of Finance, increases the administration costs of the Division approximately $500,000 for the two-year period. The quarter of a cent allocation from gas tax revenues to be expended within municipalities comes out of the State's share of the gas tax. The State has also taken over and is administering, without increase of its revenues, some 6800 miles of roads added to the State highway system in 1933.

FEDERAL AID APPORTIONMENT

In addition to these state-raised revenues the Federal Congress has made available in the adoption of the Hayden-Cartwright Act, in June, 1934, Federal aid funds for expenditure on a designated and established Federal aid system.

Of the $125,000,000 appropriation for the fiscal years 1936 and 1937, it is estimated that the apportionment to California for such purposes is $9,585,459.70.

The Federal aid system is limited to 7 per cent of the public road mileage in the State and is constituted principally of State highways. Federal aid apportionments to the State must be earned. The State performs the work on contracts based on plans approved by the Federal government and collects Federal aid moneys after completion of the work and in accordance with previously agreed participation.

The estimated revenues of $61,393,459.70 for the 87th and 88th fiscal years are available for and must cover all purposes included under the administration of State highways. From these revenues provisions must be made not only for the construction and improvement of the roads, but also for the cost of preliminary and construction engineering, rights of way, betterments and minor improvements on secondary highways, joint highway district expenditures, administration, maintenance of the State highways and of roads in State parks, the allocation to cities, and finally the establishment of a contingency for emergency repairs occasioned by floods and slides and to cover unforeseen expenditures.

ALLOCATION OF MONEYS

In the distribution of the available revenues the law provides that the cost of administration and general maintenance shall be first set aside before allocation of moneys is made to the north and south county groups and to primary and secondary highways. The State highway budget has been prepared in accordance with these provisions. The allocation of moneys is shown in the accompanying tabulation. For administration $2,558,459.70 was set up; for maintenance $15,215,500. The next amount set

(Continued on page 24)

STATE HIGHWAY BUDGET INCLUDING FEDERAL AID FOR 87th AND 88th BIENNIUM

Estimates of Revenues		
Gas tax	$46,500,000	
Motor vehicle Fees	5,308,000	
Federal Aid (Hayden-Cartwright Act, 1934)	9,585,459	
Total		$61,393,459
Allocation		
Administration	$2,558,459	
Maintenance	15,215,500	
Cities—¼ cent allocation	5,812,500	
Construction and improvements	37,807,000	
Total		$61,393,459

How North and South Share Funds

(Continued from page 23)

aside is the quarter of a cent allocation to cities of $5,812,500. This latter amount is distributed and expended within the cities in accordance with legal provisions on the basis of the proportionate population of the city to the total population of the cities in the State. Deducting these three above-mentioned amounts from the total of $61,393,459.70 leaves for all other purposes, including construction and improvements, $37,807,000.

This latter amount, by provision of the Breed Act and its subsequent amendments, is allocated 50 per cent to primary roads and 50 per cent to secondary roads. The primary allocation of 50 per cent is then divided between the north and south county groups on the basis of primary mileage in each group, which the Commission found to be 54.4 per cent in the northerly group of counties and 45.6 per cent in the southerly group. This percentage is based on a primary mileage of 2,477.98 miles in the north counties and 2,076.05 miles in the south counties. This division of primary funds produces for the northern counties $10,283,504 and for the southern counties $8,619,996, making a total of $18,903,500 for primary highways.

The 50 per cent allocated to secondary roads is divided equally between the north and south group of counties and produces $9,451,750 for each county group, or a total of $18,903,500.

The total amounts available therefore for the north group of counties on both primary and secondary highways is $19,735,254 and for the southern group of counties $18,071,746.

The detail of the allocation for primary and secondary highways, north and south, is also shown in tabulation on next page. The amounts of the various items included in this detail are estimated from and based on the cost for such work in previous bienniums. These items consist of (1) preliminary engineering; (2) construction engineering; (3) rights of way; (4) betterments and minor improvements; (5) joint highway districts; (6) contingencies, approximately 5 per cent of the major project allocation; and (7) amounts available for major projects for construction and improvement.

The total amount for major projects in the north group of counties is $14,046,300, and for the south $12,452,680 or, $26,498,980 for the State. Chapter 767 of the 1933 Statutes provides for a limited flexibility to be exercised between the allocations to primary and secondary highways and the Com-

ALLOCATION, CONSTRUCTION AND IMPROVEMENT OF HIGHWAYS

Primary North 54.4% of 50%	$10,283,504	
Primary South 45.6% of 50%	8,619,996	
Total primary		$18,903,500
Secondary North 50% of 50%	9,451,750	
Secondary South 50% of 50%	9,451,750	
Total secondary		$18,903,500
Grand total		$37,807,000
Primary North	$10,283,504	
Secondary North	9,451,750	
Total North		$19,735,254
Primary South	$8,619,996	
Secondary South	9,451,750	
Total South		$18,071,746
Grand total		$37,807,000

New Budget $8,742,459 Less Than Old

(Continued from preceding page)

mission found it necessary to make adjustment between the allocated expenditures on primary and secondary highways in each group. The total setup for the various items listed above, however, in each group of counties equals the allocation to each group, as previously explained.

The budget for the current biennium, the 85th and 86th fiscal years, totaled $70,136,000. This budget included $16,000,000 of Federal aid emergency appropriation made in 1933. The next biennial budget, for the 87th and 88th fiscal years, totals $61,393,459.70, which is $8,742,540.30 less than the current budget. This shortage of some eight and three-quarter million dollars, in addition to the fixed charges established by the Legislature, created a decided difficulty in meeting the requirements for improvement on State highways in the north county group. To meet the reduced amount available for construction and improvement it meant that the Commission had to eliminate from their program of projects many which were very urgent, important, and highly desirable.

This situation, however, was somewhat relieved by the second Federal emergency appropriation for the 1935 fiscal year made by the Federal government under the Hayden-Cartwright Act. The apportionment to California from this appropriation amounted to $7,932,206. Although this appropriation was made available a short time before the regular State highway biennial budget was adopted, the Highway Commission was able to anticipate this shortage of funds and to make allocation to projects contemplated for improvements in the next biennium by including them in a program to be paid for from the Federal emergency appropriation.

DETAIL OF ALLOCATION FOR CONSTRUCTION AND IMPROVEMENT

	North		South	
	Primary	Secondary	Primary	Secondary
1. Preliminary engineering	$205,520	$296,270	$206,555	$356,825
2. Construction engineering	411,050	305,300	413,110	572,170
3. Rights of way	587,225	654,220	472,125	735,646
4. Betterments and minor improvements	500,000	1,800,000	400,000	1,800,000
5. Joint highway districts		283,220		0
6. Contingencies	379,679	266,470	281,075	381,560
7. Major projects	9,892,500	4,153,800	5,620,500	6,832,180
Totals	$11,975,974	$7,759,280	$7,393,365	$10,678,381

RECAPITULATION

Primary North	$11,975,974	
Secondary North	7,759,280	
Total North		$19,735,254
Primary South	$7,393,365	
Secondary South	10,678,381	
Total South		$18,071,746
Grand total		$37,807,000

PROJECTS TABULATED

The program of major project allocations for the next biennial period should therefore

(Continued on page 26)

Primary Project Allocations for North

(Continued from page 25)

be considered in connection with the program of Federal emergency funds for the 1935 fiscal year. The projects included in the regular State biennial budget program and in the Federal program of 1935 apportionment are shown in accompanying tabulations. See pages 26 to 35. A tabulation is also shown, by counties, of the total allocation in each county from both programs, which shows a total of $34,757,021 for construction, reconstruction and improvement on the State highway system. This total practically equals the amount set up in the current biennium for similar purposes.

Limitation of funds, definite appropriations and commitments made by the Legislature, the necessity of bringing to completion projects in which already large investments have been made in order to realize on these investments and make the roads usable, all con-

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS—PRIMARY NORTH

County	Route	Location	Approximate mileage	Nature of improvement	Proposed expenditures, 87th and 88th fiscal years	
					Detail	Total
Humboldt	1	Salmon Creek to Bucksport	7.3	Grading and surfacing	$165,000	
Mendocino	1	Outlet Creek to Ryan Creek	1.9	Grading and surfacing	196,000	
Humboldt	1	Trinidad to McNeil	2.1	Grading and surfacing	125,000	
Mendocino	1	Eleven Oaks Road to Willits	0.8	Grading, surfacing and bridge	60,000	
Humboldt	1	City of Eureka		Grading and surfacing	60,000	
Tehama	29	Route 3 to 1.5 miles east of Dales	13.8	Surfacing	175,000	
Tehama	3	Southern Boundary to Red Bluff (portions)		Grading and shoulders	100,000	
Butte-Plumas	21	Jarboe Gap to Keddie (portions)		Tunnel construction and oiling	117,000	
Plumas	21	Storrie to Belden		Grading	155,000	
Butte-Plumas	21	Jarboe Gap to Rock Creek (portions)		Grading	520,000	
Shasta-Lassen	28	Fall River Mills to Hillside	18.0	Surfacing	67,500	
Shasta	3	China Gulch and Olney Creek bridges and approaches		Bridges and approaches	52,000	
Shasta	20	Near Old Shasta to Redding	3.0	Grading and surfacing	130,000	
Shasta	28	1.5 miles east of Bella Vista to Diddy Hill (portions)	5	Grading and surfacing	130,000	
Butte	3	Biggs Road to Chico	19.0	Grading and surfacing	95,000	
Yolo-Colusa	7	Dunnigan to Arbuckle	8.9	Grading and surfacing	180,000	
Yolo	6	East end of Causeway to M Street Subway	3.5	Grading and paving	170,000	
Yuba	3	Morrisons Crossing to Marysville	9.0	Grading and paving	235,000	
Yuba	25	Downieville Road (portions)		Grading and surfacing	75,000	
Nevada-Sierra	38	Floriston to State Line	5.0	Grading and surfacing	50,000	
Sacramento	3	Sacramento to American River	0.3	Grading and paving	50,000	
Sutter	3	In Yuba City		Grading and paving	25,000	
San Francisco-Alameda	5-68-69	San Francisco to Oakland		Grading, paving and bridges	3,300,000	
Santa Cruz	5	Scotts Valley to 1 mile north of Santa Cruz	3.9	Grading and surfacing	220,000	
Santa Clara	68	Santa Clara-Alviso Road to San Jose; Guadalupe River	3.7	Grading, paving and bridge	425,000	
Marin	1	Waldo to Golden Gate Bridge		Grading, paving and bridge	1,000,000	
Marin	1	Through San Rafael		Grading	200,000	
Monterey	2	Bradley to 6 miles south of San Ardo, Haines Creek	6.8	Grading, paving and bridge	335,000	
Monterey	2	Soledad to Gonzales	8.0	Grading and paving	158,000	
Monterey	2	Thompson Gulch		Grading and surfacing	27,000	
Monterey	2	Southern Pacific grade separation in Salinas		Structure	260,000	
Fresno	4	South limits Selma to ¾ mile north of north limits	2.0	Grading and paving	120,000	
Fresno	4	Fresno to Ashlan Avenue	4.0	Grading and paving	275,000	
Kings	10	1.5 miles east of Hanford to Hanford	1.5	Grading and paving	60,000	
Solano-Napa	7-8	Vallejo-Benicia Road to Cordelia	9.8	Grading, paving and surfacing	330,000	
Solano	7	3.5 miles north of Fairfield to 0.6 miles south Vacaville, Alamo Creek	4.0	Grading, paving and bridge	200,000	
Stanislaus	4	Turlock to Esmar	6.0	Resurfacing	50,000	
Total, Primary North						$9,892,500

Primary Project Allocations for South

(Continued from preceding page)

tributed to the difficulty of preparing an adequate program and made it impossible to meet the many requests for improvement preferred to the Commission. Many worthy projects could not be included and had to be deferred for future consideration. The projects finally included in the program, therefore, represent the essential and most needed. Practically every county in the State is included in the program.

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS—PRIMARY SOUTH

County	Route	Location	Approximate mileage	Nature of improvement	Proposed expenditures, 87th and 88th fiscal years	
					Detail	Total
Santa Barbara	2	Tajiguas Creek to Arroyo Quemado and Arroyo Hondo to 1½ miles west	2.0	Grading and paving	$137,000	
Santa Barbara	2	Arroyo Quemado to Arroyo Hondo	1.2	Grading and paving	66,000	
Santa Barbara	2	1 mile north of Rincon Creek to Carpinteria	1.6	Grading and paving	85,000	
Santa Barbara	2	Carpinteria Creek		Bridge	40,000	
Santa Barbara	2	Richfield tower to Santa Maria River	1.5	Grading and paving	65,000	
Kern	4	Los Angeles County Line to Fort Tejon	5.2	Grading and paving	400,000	
Kern	4	Famosa grade separation and approaches	1.5	Grading, paving, structure	145,000	
Tulare	10	Yokohl to Lemon Cove	5.0	Grading and surfacing	150,000	
Los Angeles	9	Verduga Road to Flintridge Country Club	1.4	Grading and paving	150,000	
Ventura	2	Conejo Grade; Conejo Creek	7.0	Grading, paving, bridge	550,000	
Los Angeles	4	Newhall Tunnel		Grading	100,000	
Los Angeles-Ventura	2	Calabasas to Conejo Grade		Grading and paving	200,000	
Los Angeles	9	Scoville Avenue to Big Tujunga Wash	2.0	Grading and paving	85,000	
Los Angeles	9	Big Tujunga Wash, N. and S. Channels		Grading and bridges	90,000	
Ventura	60	Big Sycamore line change and bridge	1.0	Grading, paving, bridge	150,000	
Ventura	60	Oxnard to Hueneme Road	4.9	Grading and paving	73,000	
Orange	60	Seal Beach to Huntington Beach	6.1	Grading and resurfacing	54,000	
Orange	60	Huntington Beach to Newport Beach	4.2	Grading and resurfacing	38,000	
Los Angeles	23	Lancaster to North Boundary	10.0	Pavement widening	50,000	
Los Angeles-Ventura	60	Encinal Canyon to Little Sycamore	5.7	Grading and paving	268,000	
Los Angeles-Ventura	60	Arroyo Sequit and Little Sycamore Creeks		Widening bridges	22,000	
Los Angeles	60	Santa Fe Railroad Yards, grade separation in Wilmington		Structure	475,000	
Los Angeles	4	Tujunga Wash		Bridge	225,000	
Los Angeles	4	Truman Street through San Fernando	1.4	Grading and paving	92,000	
Los Angeles	60	State St., Lime St. to Stanley Ave.	1.2	Grading and paving	50,000	
Los Angeles	2-4-60	Routes 2, 4 and 60 in City		Grading, paving, structures	132,000	
Riverside	26	North Boundary to west limits of Beaumont	1.5	Grading and paving	77,000	
San Bernardino-Riverside	19	Ontario to Riverside	15.0	Grading and surfaced shoulders	40,000	
San Bernardino	26	Santa Ana River to Redlands, Mission Storm Drain	5.5	Grading and paving	111,000	
San Bernardino	58	In Barstow		Grading and surfacing	35,000	
San Bernardino	58	Ludlow to 20 miles east of Amboy (portions)		Grading, bridges, drainage	20,000	
Inyo	23	Big Pine to Keough Hot Springs	8.0	Grading and surfacing	150,000	
Mono	23	2.2 miles south of Rush Creek to 2.7 miles south of Mono Inn	7.5	Grading and surfacing	125,000	
Mono	23	4 miles to 1.3 miles south of Coleville	2.7	Grading and surfacing	34,000	
Mono	23	Conway Summit to Bodie Road	3.0	Grading and surfacing	53,500	
Kern	23	Mojave to 10 miles north	10.0	Surfacing	15,000	
Mono	23	Mattly Ranch to Leevining	2.2	Surfacing	10,000	
Inyo	23	Vicinity Evans Ranch	0.7	Grading and surfacing	16,000	
San Diego	2	Del Mar to Encinitas; Del Mar grade separation	6.3	Grading, paving, structure	272,000	
San Diego	2	Oceanside to Las Flores underpass	8.0	Grading and paving	444,000	
Riverside	26	County Line to Avenue 62	9.0	Storm protection, drainage	78,000	
Imperial	26	3 miles west of Westmoreland to Trifolium Canal	4.0	Resurfacing	48,000	
San Diego	12	El Cajon Avenue		Paving	200,000	
Total, Primary South						$5,620,500
Total Primary						$15,513,000

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS—SECONDARY NORTH

County	Route	Location	Approximate mileage	Nature of improvement	Proposed expenditures, 87th and 88th fiscal years	
					Detail	Total
Del Norte	71	0.7 mile south State Line to 0.5 mile north Winton Corner	5.1	Grading and surfacing	$140,000	
Mendocino	48	Clow Creek and Oaks line change	1.7	Grading and surfacing	43,000	
Lake	15	Upper Lake to Rasmussen Ranch	1.2	Grading and surfacing	68,000	
Modoc	28	Alturas to Cedarville (portions)		Grading and surfacing	75,000	
Siskiyou	46	Klamath River Road (portions)		Grading	100,000	
Trinity	20	Trinity River Road (portions)		Grading	100,000	
El Dorado	11	Kyburz to Strawberry	9.0	Surfacing	115,000	
El Dorado	11	Echo Creek and Little Truckee River		Bridges	25,000	
Sacramento	11	Isleton to Sacramento	33.0	Grading and surfacing	80,000	
Butte	45	Westerly Boundary to Biggs Road	7.7	Surfacing	15,000	
El Dorado	11	Oglesby Canyon	1.0	Surfacing	13,000	
Contra Costa	75	Oakland to Walnut Creek (portions)	5.0	Grading and surfacing	325,000	
Sonoma	104	Cotati to Sebastopol		Grading and surfacing	75,000	
Napa	104	Sears Point Road		Purchase	41,800	
Alameda-Contra Costa	69	Ashby Ave. to San Pablo Ave.	5.4	Grading and paving	550,000	
Monterey	10	Lewis Creek to Priest Valley	1.2	Grading	30,000	
Monterey	56	Partington's Canyon to Post's Summit	6.5	Grading and surfacing	622,000	
Monterey	56	Torre Canyon		Bridge	67,000	
Monterey	56	Post's Summit to Big Sur	2.3	Grading and surfacing	78,000	
Monterey	56	Convict Gulch		Bridge	27,000	
Monterey	56	Moleras Ranch to 1.6 miles southerly	1.6	Grading and surfacing	81,000	
San Benito	119	Pinnacles Park to Hollister (portions)		Grading and surfacing	100,000	
Fresno	41	Kings River Canyon		Grading	300,000	
Madera	125	Kelshaw to Coarsegold	8.0	Grading and surfacing	230,000	
Kings	10	Hanford westerly	2.5	Grading and paving	40,000	
Napa	7	1 mile north Carquinez Bridge to Vallejo-Benicia Road	1.4	Paving	75,000	
Tuolumne	13	Sullivan Creek to Pooley's (portions)	3.5	Grading and surfacing	100,000	
San Joaquin	53	Potato Slough Bridge and approaches, west of Terminous	0.4	Draw bridge, grading, surfacing	150,000	
Solano	7	In City of Benicia		Grading and surfacing	10,000	
		Prison Labor Camps		Grading	478,000	
Total, Secondary North						$4,153,80

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS—SECONDARY SOUTH

County	Route	Location	Approximate mileage	Nature of improvement	Proposed expenditures, 87th and 88th fiscal years	
					Detail	Total
San Luis Obispo	125	Cholame to Kern County Line	7.5	Grading and surfacing	$217,000	
San Luis Obispo	125	Cholame Creek		Bridge	23,000	
Santa Barbara	80	Santa Barbara Ave. to Los Olivos and Alamo Pintado Creek	5.7	Grading, surfacing, bridge	141,000	
Kern	58	Seivert to Bear Mountain Ranch	14.0	Surfacing	45,000	
Tulare	129	1 mile south to 1 mile north of Lindsay	3.0	Grading and paving	150,000	
Kern	58	Tehachapi to Mojave (portions)		Grading and surfacing	125,000	
Kern	139	4 miles south of Shafter northerly 2.5 miles	2.5	Grading and surfacing	75,000	
Kern	142	Kern River Bridge and approaches	1.0	Bridge, grading, surfacing	75,000	
Kern	141	3 bridges, Oak St. route		Bridges	30,000	
Kern	58	3 bridges, east of McKittrick and of junction Route 139		Bridges	32,000	
Los Angeles	26	Rio Honda		Bridge	135,000	
Ventura	138	San Antonio Creek Bridge and approaches		Bridge, grading, surfacing	35,000	
Los Angeles	168	Union Pacific subway at Telegraph Road		Pumping system	5,000	
Los Angeles	168	Cerritos Ave., Los Angeles St. to Artesia St.	2.0	Grading and paving	75,000	
Orange	176	Carolina Ave. to Santa Ana River (portions) Pacific Electric grade separation	3.4	Grading, surfacing, structure	110,000	
Orange	174	Manchester Ave., Anaheim to Miraflores	1.3	Grading and paving	48,000	
Los Angeles	166	San Gabriel River		Bridge	70,000	
Los Angeles	61	Red Box to Mt. Islip (portions)		Grading and surfacing	300,000	

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS – SECONDARY SOUTH—Continued

County	Route	Location	Approximate mileage	Nature of improvement	Proposed expenditures, 87th and 88th fiscal years	
					Detail	Total
Los Angeles	158	Sepulveda Blvd., Culver City to Centinella Ave.	1.2	Grading and paving	$85,000	
Los Angeles	166	Route 170 to Route 171, through Santa Fe Springs	1.4	Grading and paving	100,000	
Orange	43	Santa Ana Canyon Road, Gypsum Creek to County Line	2.6	Grading and paving	150,000	
Los Angeles	62	Coldbrook Camp to Ranger Station	7.0	Grading	40,000	
Ventura	153	Camarilla to Oxnard (portions)		Grading and paving	100,000	
Ventura	79	Sespe Ranch to Fillmore and at Piru		Grading and paving	180,000	
Orange	175	Southeast of Placentia	1.0	Grading and paving	36,000	
Orange	179	Santa Ana River		Bridge	42,000	
Los Angeles	62	Glendora Ave. over Walnut Creek		Bridge	10,000	
Ventura	9	Somis to Saticoy	6.3	Grading and shoulders	53,000	
Los Angeles	167	Los Angeles River on Atlantic Blvd.		Bridge	135,000	
Orange	183	Santa Ana River, Bolsa Ave.		Bridge	42,000	
Los Angeles	168	Rosemead Ave., Whittier Blvd. to Foothill Blvd. (portions), Rio Honda River	10.0	Grading, paving, bridge	350,000	
Los Angeles	172	Third St. at city limits to San Gabriel Blvd.	6.5	Grading and paving	440,000	
Los Angeles	158	Sepulveda Blvd. (portions)		Grading, paving, structures	250,000	
Los Angeles	162	Santa Monica Blvd., Beverly Hills to Seward		Grading, paving, structures	200,000	
Los Angeles	162	Santa Monica Blvd., Heath to Sepulveda		Grading, paving, structures	350,000	
Los Angeles	165	Figueroa St. (portions)		Grading, paving, structures	481,930	
Los Angeles	172	Fourth St., Indiana to Fresno		Grading and paving	50,000	
Los Angeles	173	Tenth St. (portions)		Grading and paving	250,000	
Riverside	19	Box Springs to Theodore St.	8.9	Grading and surfacing	167,000	
Riverside	19	Beaumont to Bad Lands, grade separation	2.3	Grading, surfacing, structure	73,000	
Riverside	194	Junction Routes 194 and 19 to new connection	2.5	Grading and surfacing	39,000	
San Bernardino	26	East limits of Colton to Waterman Ave., Santa Ana River	1.9	Grading, paving, bridge	330,000	
San Bernardino	190	Indian Creek Wash		Bridge	10,000	
San Bernardino	191	Dip on Verdemont Cutoff		Bridge	10,000	
Riverside	77	Santa Ana River (Prado)		Bridge	21,000	
San Bernardino	77	Pomona (Garey Ave.) to Merrill Ave.	4.0	Grading and surfacing	66,000	
Riverside	77	San Jacinto River at Elsinore		Bridge	25,000	
Riverside	78	Temecula Creek Bridge Mile Post 72.3		Bridge	10,000	
San Bernardino	59	Route 43 to north of Arrowhead Dam (portions)	7.5	Grading and surfacing	75,000	
San Bernardino	188	Mt. Anderson to Camp Seeley	3.0	Grading and surfacing	40,000	
Mono	96	Bridgeport to 3 miles east of Walker River Dam	6.0	Grading and surfacing	15,000	
Mono	40	Route 23 to Tioga Summit (portions)		Grading and surfacing	15,000	
Inyo	128	Death Valley Junction to State Line	7.3	Grading and surfacing	9,000	
Inyo	127	6 miles west of Darwin to Panamint Sink	18.0	Grading and surfacing	25,000	
Mono	13	Route 23 to Sonora Summit (portions)		Grading and surfacing	13,000	
Kern	145	Searls to Randsburg	6.7	Grading and surfacing	8,000	
Mono	95	Near Coleville to State Line	11.3	Grading and surfacing	15,000	
Inyo	127	Eichbaum Toll Road		Purchase	18,900	
Inyo	76	Lake Sabrina to Bishop	18.0	Grading	20,000	
Inyo-Mono	76	Route 23 to 20 miles north	20.0	Grading and surfacing	38,000	
Kern	57	Weldon to Onyx (portions)		Grading and surfacing	8,000	
Kern	57	8 miles west of Freeman to 18 miles east	9.8	Grading and surfacing	22,500	
Riverside	64	Ehrenberg Bridge		Principal and interest	50,850	
Imperial	187	Holtville to Brawley (portions)		Resurfacing	104,000	
San Diego	77	Lake Hodges to Escondido	3.1	Grading and resurfacing	85,000	
Riverside	187	Mecca to Route 26 (portions)		Grading and surfacing	25,000	
Riverside	64	10 miles west of Indio to Indio	10.0	Grading, surfacing, bridge	140,000	
Imperial	202	Calexico to Highline Canal, Alamo River and Highline Canal	12.9	Grading, surfacing bridges	100,000	
Imperial	187	Brawley to Calipatria (portions)		Grading and surfacing	75,000	
Imperial	201	East Heber to East Brawley (portions)		Grading and surfacing	59,000	
Riverside	146	Palo Verde to Route 64	17.5	Grading and surfacing	50,000	
San Diego	198	San Vicente Creek		Bridge	23,000	
San Diego	195	Pauma Creek and approaches		Bridge and grading	20,000	
Total, Secondary South						$6,832,180
Total Secondary						$10,985,980
Grand total, Primary and Secondary						$26,498,980

PROGRAM OF 1935 FEDERAL AID APPORTIONMENT FOR NORTHERN COUNTIES

Route	Location	Length, miles	Improvement	Amount
	ALAMEDA COUNTY			
5	Oakland—38th and Moss Avenue; Market to Webster	0.7	Grading and paving	$115,000
5	Hayward—S. city limits to B Street	0.8	Grading and paving	25,000
5-14	Oakland-Emeryville—Grade separation San Francisco-Oakland Bay Bridge Approach		Structure	175,000
	Total Alameda County			$315,000
	ALPINE COUNTY			
24	State line to 2.6 miles west	2.6	Grading and surfacing	$33,000
	Total Alpine County			$33,000
	AMADOR COUNTY			
34	Jackson to Martell	1.5	Grading and surfacing	$55,000
	Total Amador County			$55,000
	DEL NORTE COUNTY			
1	Oregon Mt. Summit to state line	4.2	Surfacing	$61,000
	Total Del Norte County			$61,000
	FRESNO COUNTY			
4	Selma to Fowler Switch Canal	1.0	Grading and paving	$64,600
41	Kings River bridge and approaches near Centerville		Grading, surfacing, structure	80,000
	Total Fresno County			$144,600
	GLENN COUNTY			
7	Willows to Orland	15.0	Grading and shoulders	$75,000
	Total Glenn County			$75,000
	HUMBOLDT COUNTY			
56	Fernbridge to Ferndale	5.8	Shoulders, curve correction	$13,000
	Total Humboldt County			$13,000
	LAKE COUNTY			
15	Rasmussen Ranch to Manila Ranch	2.5	Grading and surfacing	$95,000
	Total Lake County			$95,000
	LASSEN COUNTY			
29	State line to Route 21 (see Sierra County)	5.8	Grading and surfacing	$77,000
29	Through Susanville	0.8	Resurfacing	8,100
	Total Lassen County			$85,100
	MADERA COUNTY			
125	Coarsegold to Hawkins School	7.9	Grading	$240,000
	Coarsegold to Oakhurst		Surfacing	
4	Madera—through city	1.3	Grading, paving, structure	85,000
	Total Madera County			$325,000
	MENDOCINO COUNTY			
1	Red Mt. Creek bridge and approaches	0.3	Grading, surfacing, structure	$85,000
1	McCoy Creek bridge and approaches	0.2	Grading, surfacing, structure	22,000
1	Willits—Main Street; Broadus Cr. to N. W. P. R.R. and at Monroe Street	0.5	Grading and surfacing	8,200
1	Ukiah—State Street; Mill Street to N. city limits	0.8	Resurfacing	7,600
	Total Mendocino County			$122,800
	MERCED COUNTY			
	Merced—through city	1.4	Widening and resurfacing	$47,000
	Total Merced County			$47,000
	MODOC COUNTY			
Feeder Rd.	Tule Lake Road; G. N. R. R. northeasterly	4 ±	Grading and surfacing	$75,000
	Total Modoc County			$75,000

PROGRAM OF 1935 FEDERAL AID APPORTIONMENT FOR NORTHERN COUNTIES—Continued

Route	Location	Length, miles	Improvement	Amount
	MONTEREY COUNTY			
56	Limekiln Creek Bridge		Bridge	$40,000
56	Vicente Creek Bridge		Bridge	48,000
56	Big Creek Bridge		Bridge	90,000
56	Burns Creek Bridge		Bridge	75,000
56	Mal Paso Creek Bridge		Bridge	40,000
	Total Monterey County			$293,000
	NEVADA COUNTY			
17	Through Grass Valley (portions)	0.5	Resurfacing	$5,000
	Total Nevada County			$5,5000
	PLUMAS COUNTY			
21	Rock Creek to Storrie	2.5	Grading	$195,000
21	North Fork Feather River; bridges at Tobin, Storrie and Rock Creek		Bridges	206,000
	Total Plumas County			$401,000
	SACRAMENTO COUNTY			
3	North Sacramento to Ben Ali	1.4	Landscaping	$7,500
3	American River Bridge near Sacramento		Landscaping	200
4	Cosumnes River Bridge to McConnel	0.3	Landscaping	500
100	Steamboat Slough to Ryde	3.0	Grading and surfacing	30,000
	Total Sacramento County			$38,200
	SAN BENITO COUNTY			
22	Route 2 to San Juan Bautista	3.5	Grading and surfacing	$73,000
	Rocks Road, San Juan to Prunedale Cutoff		Landscaping	5,000
	Total San Benito County			$78,000
	SAN JOAQUIN COUNTY			
5	French Camp to Stockton	3.6	Grading and paving	$114,000
Feeder Rd.	Fresno Ave. grade separation, Santa Fe Railroad south of Stockton			20,000
	Total San Joaquin County			$134,000
	SAN MATEO COUNTY			
68	South San Francisco Subway, S. P. R. R.		Structure	$190,000
2	Daly City—Mission Street; Colma to junction San Jose Avenue	1.2	Grading and paving	187,000
2	San Mateo—3d Avenue to Crystal Springs Road; San Mateo Creek Bridge	0.2	Grading, paving, structure	35,000
105	Skyline Blvd. to Half Moon Bay	2.7	Grading and surfacing	178,000
56	Skyline Blvd. to junction Alemany and Junipero Serra Blvds.	1.6	Grading and paving	150,000
	Total San Mateo County			$740,000
	SANTA CLARA COUNTY			
68	Agnew grade separation, S. P. R. R.		Structure	$200,000
Feeder Rd.	4th Street extension; N. city limits San Jose to Bay Shore Blvd.	1.2	Grading and paving	128,000
	4th Street extension; N. city limits San Jose to Bay Shore Blvd.	1.2	Grading and paving	128,000
	Total Santa Clara County			$328,000
	SHASTA COUNTY			
3	North approach Sacramento River Bridge at Redding		Grading, paving, structure	$53,000
3	South approach Sacramento River Bridge at Redding		Grading, paving, structure	83,000
20	Redding—overhead crossing S. P. R. R. on Eureka Way and approaches		Grading, paving, structure	40,000
	Total Shasta County			$176,000
	SIERRA COUNTY			
29	State line to Route 21 (see Lassen County)	3.2	Grading and surfacing	$43,000
25	Yuba River at Downieville; bridge and approaches		Grading, paving, structure	35,000
	Total Sierra County			$78,000
	SISKIYOU COUNTY			
72	Pineland easterly	10 ±	Grading	$150,000
	Total Siskiyou County			$150,000

PROGRAM OF 1935 FEDERAL AID APPORTIONMENTS FOR NORTHERN COUNTIES—Continued

Route	Location	Length, miles	Improvement	Amount
	SOLANO COUNTY			
7	Cordelia subway		Landscaping	$750
7	Fairfield—through city	0.7	Resurfacing	25,000
Feeder Rd.	Liberty Island Road: Cache Slough northerly	2.0	Grading and surfacing	10,000
	Total Solano County			$35,750
	SONOMA COUNTY			
1	Santa Rosa—Mendocino Street: N. city limits to 4th Street	1.0	Grading and paving	$75,000
	Total Sonoma County			$75,000
	STANISLAUS COUNTY			
110	San Joaquin River Bridge, Maze Road		Bridge and approaches	$100,000
	Total Stanislaus County			$100,000
	SUTTER COUNTY			
15	Yuba City—Colusa Avenue: Route 3 to West city limits	0.5	Widening, shoulders, drainage	$2,500
87	Robbins to 2.3 miles south	2.5	Surfacing	30,000
	Total Sutter County			$32,500
	TEHAMA COUNTY			
3	Subway line change at Red Bluff		Grading and surfacing	$20,000
	Total Tehama County			$20,000
	YOLO COUNTY			
6	M Street subway to Sacramento River bridge	0.4	Landscaping	$20,000
7	Woodland—East Street: South city limits to Main Street	0.5	Grading and paving	35,000
	Total Yolo County			$55,000
	YUBA COUNTY			
3	Widening 7 bridges: Dry Creek, Best Slough, Kimball Creek, Reed Creek, Hutchinson Creek, Branches Reed Creek		Widening bridges	$50,000
15	Marysville—Subway to East city limits	1.0	Grading and surfacing	5,000
	Total Yuba County			$55,000

PROGRAM OF 1935 FEDERAL AID APPORTIONMENT FOR SOUTHERN COUNTIES

Route	Location	Length, miles	Improvement	Amount
	IMPERIAL COUNTY			
27	Highline Canal to East Side Sand Hills	27.5	Oiled shoulders	$50,000
187	Alamo River Bridge east of Brawley		Bridge	24,000
26	Bridge 0.7 mile west of Calexico		Bridge	5,000
	Total Imperial County			$79,000
	INYO COUNTY			
23	Near North county line	0.5	Grading and surfacing	$15,000
23	Near Tinemaha	2.0	Grading and surfacing	18,000
	Total Inyo County			$33,000
	KERN COUNTY			
4	Pierce Road to Tank Farm	2.2	Landscaping	$655
4	Delano grade separation S. P. R. R and approaches	1.0	Grading and paving	130,000
140	Pumping Plant easterly	3.0	Grading and surfacing	50,000
	Total Kern County			$180,655
	LOS ANGELES COUNTY			
4	Oak Glenn to Saugus	4.4	Grading and paving	$98,500
U	5 bridges over Flood Control channels		Bridges	60,000
60	Las Flores to Winters Canyon: Carbon Canyon Bridge and widen Malibu Creek Bridge	3.4	Grading and paving	173,000
26	Monterey Park to Mt. View	5.2	Grading, surfacing, curbs	125,000

PROGRAM OF 1935 FEDERAL AID APPORTIONMENT FOR SOUTHERN COUNTIES—Continued

Route	Location	Length, miles	Improvement	Amount
	LOS ANGELES COUNTY—Continued			
60	Long Beach—State Street: Loma Avenue to Hathaway Avenue	0.5	Grading and paving	$60,500
60	Santa Monica—California Street Incline to Colorado Street	0.8	Grading and paving	124,000
26	Monterey Park—Garvey Avenue through city	1.6	Grading and paving	46,000
4	Los Angeles—Marengo Street: Soto Street to Mission Road	1.0	Grading and paving	35,000
4	Los Angeles—Marengo Street: overhead structure, Pacific Electric Railway		Structure	110,000
4	Los Angeles—San Fernando Road near Cascades		Structure	20,000
2	Los Angeles—Sunset Boulevard: Figueroa to Hillhurst Avenue	3.2	Resurfacing	60,000
60	Santa Monica—Tunnel under Colorado and Ocean Avenue		Structure	255,000
60	Santa Monica—Ocean Avenue to Lincoln Avenue	0.5	Grading and paving	75,000
60	Los Angeles—O and Streets: Wilmington Boulevard to Alameda Street	2.0	Grading and paving	150,000
60	Long Beach, Signal Hill—State Street: Stanley Avenue to Loma Avenue	0.7	Grading and paving	60,000
60	Los Angeles, Santa Monica—Channel Road to California Street Incline	1.0	Landscaping	8,900
168	Cerritos Avenue; State Street to Los Angeles Street	4.0	Grading and paving	132,000
	Total Los Angeles County			$1,592,900
	MONO COUNTY			
23	Bodie Road to Point Ranch	3.1	Grading and surfacing	$45,000
	Total Mono County			$45,000
	ORANGE COUNTY			
174	Manchester Avenue; Buena Park to Anaheim	5.2	Grading and paving	$169,000
181	Glassell Avenue; Seventeenth Street to Fairhaven Avenue	1.0	Grading and paving	50,000
	Total Orange County			$219,000
	RIVERSIDE COUNTY			
26	Beaumont to Cabazon	1.0	Eliminate dips	$58,000
26	Banning to Whitewater	16.5	Grading and widen pavement	150,000
64	4 miles W. Shavers Summit to Shavers Summit	4.0	Grading and surfacing	112,000
77	San Jacinto River Bridge S. of Elsinore		Bridge	25,000
	Total Riverside County			$345,000
	SAN BERNARDINO COUNTY			
26	Riverside Avenue to Colton	3.5	Grading and paving	$115,000
26	Pomona to Ontario	2.4	Landscaping	620
43	Subway Santa Fe R. R. S. of Colton and approaches		Grading, pavement, structure	70,000
26	Colton—I Street through city	1.4	Grading and paving	145,000
26	Ontario—A Street; San Antonio Avenue to east city limits	1.6	Widening and paving	35,000
9	San Bernardino—Mt. Vernon Avenue Viaduct	0.4	Landscaping	2,080
	Total San Bernardino County			$367,700
	SAN DIEGO COUNTY			
2	Encinitas to Oceanside	10.0	Landscaping	$6,500
12	El Cajon—Main Street; Chambers Street to east city limits	0.7	Grading and paving	40,000
2	Oceanside—Wisconsin Street to 8th Street	1.0	Resurfacing	15,000
2	Oceanside—In Oceanside	0.2	Landscaping	500
198	Through "Narrows" east of Julian	1.5	Grading and surfacing	30,000
200	Potrero Grade (portions)	3±	Grading	50,000
Feeder Rd.	Lake Hodges Road	8.5	Grading and surfacing	75,000
	Total San Diego County			$217,000
	SANTA BARBARA COUNTY			
2	Nojoqui Grade	3.7	Grading and paving	$447,000
2	Elwood overhead and approaches	0.9	Landscaping	280
2	West city limits Santa Barbara to Hollister Avenue	2.1	Landscaping	1,500
2	Solomon Canyon Slope Experiment	0.1	Landscaping	5,000
2	Through Santa Barbara	3.8	Landscaping	11,250
	Total Santa Barbara County			$465,030
	TULARE COUNTY			
4	Tulare—J and K Streets through city	1.0	Grading and paving	$48,000
134	Tulare to Lindsay	6.0	Resurfacing and widen	25,000
	Total Tulare County			$73,000
	VENTURA COUNTY			
2	Mussel Shoal to Santa Barbara County line	3.6	Grading and paving	$240,000
2	Ventura to Mussel Shoal	8.5	Landscaping	4,000
9	Harmon Canyon (2 miles east of Route 2)		Culvert, fill and surfacing	35,000
	Total Ventura County			$279,000

SUMMARY OF ALL PROJECT ALLOCATIONS—BY COUNTIES

Northern Counties

County	S. H. Funds 87th and 88th fiscal year	U. S. Funds 1935 allotment	County total
Alameda	$2,065,000	$315,000	$2,380,000
Alpine		33,000	33,000
Amador		55,000	55,000
Butte	630,000		630,000
Colusa	65,000		65,000
Contra Costa	460,000		460,000
Del Norte	140,000	61,000	201,000
El Dorado	153,000		153,000
Fresno	695,000	144,600	839,600
Glenn		75,000	75,000
Humboldt	350,000	13,000	363,000
Kings	100,000		100,000
Lake	68,000	95,000	163,000
Lassen	38,500	85,100	123,600
Madera	230,000	325,000	555,000
Marin	1,200,000		1,200,000
Mendocino	299,000	122,800	421,800
Merced		47,000	47,000
Modoc	75,000	75,000	150,000
Monterey	1,685,000	293,000	1,978,000
Napa	116,800		116,800
Nevada		5,000	5,000
Plumas	272,000	401,000	673,000
Sacramento	130,000	38,200	168,200
San Benito	100,000	78,000	178,000
San Francisco	1,650,000		1,650,000
San Joaquin	150,000	134,000	284,000
San Mateo		740,000	740,000
Santa Clara	425,000	328,000	753,000
Santa Cruz	220,000		220,000
Shasta	341,000	176,000	517,000
Sierra	50,000	78,000	128,000
Siskiyou	100,000	150,000	250,000
Solano	540,000	35,750	575,750
Sonoma	75,000	75,000	150,000
Stanislaus	50,000	100,000	150,000
Sutter	25,000	32,500	57,500
Tehama	275,000	20,000	295,000
Trinity	100,000		100,000
Tuolumne	100,000		100,000
Yolo	285,000	55,000	340,000
Yuba	310,000	55,000	365,000
Prison labor camps	478,000		478,000
Totals	$14,046,300	$4,240,950	$18,287,250

SUMMARY OF ALL PROJECT ALLOCATIONS—BY COUNTIES—Continued

Southern Counties

County	S. H. Funds 87th and 88th fiscal year	U. S. Funds 1935 allotment	County total
Imperial	$377,000	$79,000	$456,000
Inyo	256,000	33,000	289,000
Kern	980,500	180,655	1,161,155
Los Angeles	5,225,930	1,592,900	6,818,830
Mono	301,400	45,000	346,600
Orange	520,000	219,000	739,000
Riverside	782,850	345,000	1,127,850
San Bernardino	710,000	367,700	1,077,700
San Diego	1,044,000	217,000	1,261,000
San Luis Obispo	240,000		240,000
Santa Barbara	534,000	465,000	999,030
Tulare	300,000	73,000	373,000
Ventura	1,181,000	279,000	1,460,000
Totals	$12,452,680	$3,896,285	$16,348,965

SUMMARY OF TOTALS

	S. H. Funds 87th and 88th fiscal year	U. S. Funds-1935 allotment	Total
Northern counties	$14,046,300	$4,240,950	$18,287,250
Southern counties	12,452,680	3,896,285	16,348,965
*U. S. Funds	. .	120,806	120,806
Grand totals	$26,498,980	$8,258,041	$34,757,021

*Federal funds allotted to grade crossing protection not yet distributed to individual projects.

Prevailing Wage Rate Suit Decision Permits Projects to Proceed

THE SUPREME COURT of California, on December 26, 1934, rendered an important decision in a test mandamus proceeding instituted by the Southern California Roads Company, as petitioner, against the Board of Public Works of the City of Los Angeles, as defendant.

The city board refused to execute a contract with the petitioner upon the ground that neither the notice inviting bids for the improvement of Sepulveda Boulevard from National Boulevard to Venice Boulevard, in the City of Los Angeles, nor the draft of the proposed contract specified the general prevailing rate per diem wages in the City of Los Angeles for each craft or type of workman needed to perform the contract.

The section of city street involved was made a part of the secondary State highway system by the Legislature of 1933. The State Department of Public Works, as authorized by law, had entered into a cooperative agreement with the City of Los Angeles whereby the city agreed to handle the construction of this and certain other units of State highways, within the municipal boundaries by direct city contract.

The cost of these improvements was to be provided by the State and the work was to be subject to the approval of the State Department of Public Works.

The successful bidder sought a writ of mandate to compel the execution of the contract, contending that the improvement of Sepulveda Boulevard was a "municipal affair" and that in the performance of such work under the proposed city contract it was not subject to the Public Works Wage Rate Act of 1931.

If, therefore, the contemplated work was a "municipal affair," as this term is used in the Constitution, the Public Works Wage Rate Act, being a general law, would not be applicable to the contract providing for such employment.

However, the Supreme Court ruled that under the existing circumstances the improvement of the street was not a "municipal affair" but was an affair in which the State had a direct and vital interest.

The court denied the petition of the Southern California Roads Company, and, according to the press the City Board of Public Works has since ordered this contract and several similar contracts, affected by the decision, canceled and the proposed improvements are to be readvertised for new bids.

Every Sixth Person in California Dependent on Use of Highways

AUTOMOTIVE, petroleum, and other trades connected with highway transportation provide jobs and wages for one out of every six persons employed in wholesale, retail, and service trades in the State of California. This statement, based on recently completed Census Bureau figures for the year 1933, was made by the National Highway Users Conference.

Among other things, the Conference analysis shows:

Out of a total of 131,167 wholesale, retail, and service establishments that operated in 1933 in California, 26,530, or approximately one-fifth were wholly dependent on motor transport.

Of the total pay roll of $400,140,000 for all wholesale, retail, and service trades, $70,106,000 or 17.5 per cent, accrued from automotive, petroleum and allied trades.

The total volume of sales for all wholesale, retail, and service business in the State amounted to $4,115,389,000, of which $714,500,000 represented purchases by motor vehicle owners of all classes.

"These figures," said Roy F. Britton, Director of the National Highway Users Conference, "enable us for the first time to get a clear and accurate conception of the contribution of the highway transportation industries to the economic welfare of the State.

"Except for the continued needs of the motoring public, every fifth business house or service establishment in California would close; every sixth person employed in the wholesale, retail, or service trades would lose his job; and more than one-sixth of the business pay roll of the State would dry up instantly."

Highway Bids and Awards for Nov.-Dec.

COLUSA COUNTY—Street widening in town of Williams, 7th St. from F St. to D St., and E St. from 8th to 6th St., District III, Route 7-15, Sec. Wms. P. F. Bender, Sacramento, $6,450; Carl R. Fiedler, Sacramento, $5,882; John Carcano, San Rafael, $3,472; Y. C. Soda, Oakland, $4,241; Lee J. Immel, Berkeley, $3,943. Contract awarded to Albany Cement Contractors, Inc., Albany, $3,455.00.

CONTRA COSTA COUNTY—Construct R. C. pedestrian subway, Tenth and Black Diamond Streets, at Pittsburg. District IV, Route 75, Section Pit. Independent Construction Co., Ltd., Oakland, $5,114; A. Soda & Son, Oakland, $5,985; Alfred T. Howe, Santa Rosa, $6,112; Oliver S. Almlie, San Francisco, $5,164; Theodor Johanns, San Francisco, $6,214; Albany Cement Contractors, Inc., Albany, $5,543; J. J. Ongaro & A. H. Siemer, San Anselmo, $5,311; Bundesen & Lauritzen, Pittsburg, $5,580; John Carcano, San Rafael, $5,620. Contract awarded to Lee J. Immel, Berkeley, $4,891.00.

FRESNO COUNTY—Steel beam bridge across Kings River with concrete deck, 1⅛ miles east of Centerville, 1-70', 2-63' and 2-62' spans on concrete piers and abutments. About 1.2 miles roadway approaches to be graded and surfaced with bituminous treated crushed gravel or stone. District VI, Route 41, Section S. Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $85,757; Bodenhamer Construction Co., Oakland, $69,919; C. W. Caletti & Co., San Rafael, $73,813. Contract awarded to Wm. C. Horn Company, Pomona, $66,813.74.

FRESNO COUNTY—Between Selma & Fowler Switch Canal, about 1 mile to be graded and paved with asphalt concrete, Dist. VI, Rt. 4, Sec. A. Valley Paving and Const. Co., Fresno, $58,164. Contract awarded to Union Paving Co., San Francisco, $57,-634.40.

KERN COUNTY—Under grade crossing at Union Ave., Bakersfield, under A. T. & S. Fe R. R., 2 concrete abutments with wing walls and steel plate girder span. Approaches, 0.26 mile to be graded and paved with Portland cement concrete. Dist VI, Rt. 4, Sec. Bkd. Sharp & Fellows Const. Co., Los Angeles $71,-393; Oscar Oberg, Los Angeles, $71, 633; Griffith Company, Los Angeles $72,012; Fredrickson & Watson Const. Co., Fredrickson Bros., Oakland, $82,457; M. B. McGowan, Inc., San Francisco, $86,968. Contract awarded to Rocca & Co., San Rafael, $68,617.50.

KERN COUNTY—Between one mile east of Taft and one-half mile west of Taft, about 1.6 miles to be graded and surfaced with bituminous treated crushed gravel or stone. District VI, Route 138, Section A and Taft. Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $45,915; C. O. Sparks, Los Angeles, $49,240; Griffith Company, Los Angeles, $48,345; L. A. Brisco, Arroyo Grande, $49,896. Contract awarded to D. O. C. Construction Co., Robert D. Patterson, Santa Barbara, $39,873.45.

LASSEN-SIERRA COUNTIES — About 2.8 miles north of junction Routes 21 & 29 and Nevada State line, about 10.5 miles to be graded and oiled. District II, Route 29, Section E, A. Dodge Construction, Inc., Fallon, Nev., $100,124; Marrison Knudsen Co., Los Angeles, $96,893; A. Teichert & Son, Sacramento, $99,681; Isbell Construction Co., Carson City, Nev., $107,301; Peninsula Paving Co., San Francisco, $98,-829; George Pollock Co., Sacramento, $88,783; Fredrickson & Watson Co., Fredrickson Bros., Oakland, $91,663. Contract awarded to Harms Bros., Sacramento, $82,984.50.

LOS ANGELES COUNTY—In Long Beach, between Pacific Avenue and Olive Ave., about 0.6 mile, to be graded and paved with asphalt concrete. District VII, Rt. 60, Sec. L.Bch. Sully Miller Const. Co., Long Beach, $40,787; Oswald Bros., Los Angeles, $42,117.75; Los Angeles Paving Co., Inc., Los Angeles, $44,844.75. Contract awarded to Griffith Co., Los Angeles, $38,-522.50.

LOS ANGELES COUNTY—Between Newhall Tunnel and Saugus, about 4.4 miles to be graded and paved with asphalt concrete. Dist VII, Rt. 4, Sec. E. Southwest Paving Co., Los Angeles, $92,601; Griffith Co., Los Angeles, $93,362; George R. Curtis Paving Co., Los Angeles, $97,670; P. J. Akmadzich, Los Angeles, $111,133. Contract awarded to Oswald Bros., Los Angeles, $85,504.90.

LOS ANGELES COUNTY. Between Los Angeles City Pumping Plant and West Channel Road, about 0.3 mile to be graded and paved with asphalt concrete. District VII, Route 60, Section B. C. O. Sparks, Los Angeles, $7,636; H. E. Cox & Son, Pasadena, $8,386; L. A. Paving Co., Los Angeles, $9,888. Contract awarded to Griffith Co., Los Angeles, $8,-350.20.

MONTEREY COUNTY—On Munras Ave., Abrego St., and Fremont St., in the City of Monterey, about 1.4 miles, bituminous surface treatment to be applied. District V, Routes 56 & 117, Section Mon. Granite Const. Co., Ltd., Watsonville, Cal., $7,667; Tiffany Const. Co., San Jose, $7,295; Force Const. Co., Oakland, $10,935; J. L. Conner, Monterey, $9,589; Leo F. Piazza, San Jose, $8,961; Walter B. Roselip, San Luis Obispo $7,829. Contract awarded to L. A. Brisco, Arroyo Grande, $6,795.70.

MONTEREY COUNTY—Steel bridge with concrete deck across Burns Creek, 46 miles south of Monterey. District V, Route 56, Section D. Harry J. Oser, San Francisco, $68,537; Bodenhamer Const. Co., Oakland, $67,065; Fredrickson & Watson Construction Co., & Fredrickson Bros., Oakland, $74,675; C. W. Caletti & Co., San Rafael, $69,449; B. A. Hawkins & Co., San Francisco, $69,756; M. B. McGowan, Inc., San Francisco, $68,074; Neves & Harp, Santa Clara, $72,322. Contract awarded to R. R. Bishop, Long Beach, $64,-014.50.

ORANGE COUNTY—Between 0.4 mile east of Peralta School and Gypsum Creek about 3.4 mile to be graded and paved with Portland cement concrete. Dist. VII, Route 43, Sec. B. Basich Bros., Torrance, $172,061; J. E. Haddock, Ltd., Pasadena, $199,811; Sander Pearson, C. O. Sparks & Mundo Eng. Co., Los Angeles, $184,383; J. L. McClain, Los Angeles, $169,-655; Oswald Bros., Los Angeles, $173,246; Daley Corp., San Diego, $197,289. Contract awarded to Sharp & Fellows Const. Co., Los Angeles, $165,487.70.

PLUMAS COUNTY—Bridge across North Fork Feather River at Tobin—One 290' through structural truss span, 2-35' concrete box abutments. District II, Route 21, Section A. C. W. Caletti & Co., San Rafael, $74,681; Portland Bridge Co., Portland, Oregon, $83,-686; M. B. McGowan, Inc., San Francisco, $73,691; J. H. Pomeroy & Co., Inc., San Francisco, $84,952. Contract awarded to Rocca & Co., San Rafael, $69,469.

SACRAMENTO COUNTY—Repair two bridges near Walnut Grove, one across Georgiana Slough, one across N. Fork Mokelumne River, Dist. X, Rt. 53, Sec. B. Healy Tibbitts Const. Co., San Francisco, $11,963; Bundensen & Lauritzen, Pittsburg, $12,024; Ben C. Gerwick, Inc., San Francisco, $12,417; M. A. Jenkins, Sacramento, $12,439. Contract awarded to Christian A. Lauritzen, Antioch, $11,769.70.

SAN BENITO COUNTY—Between Route 2 and San Juan Bautista, about 2.6 miles to be graded and surfaced with crushed run base and oil treated crushed run surfacing. District V. Route 22, Section C. & S.J.B. Peninsula Paving Company, San Francisco, $61,536; Earl W. Heple & L. A. Brisco, San Jose, $64,438; Tiffany Construction Co., San Jose, $62,964; Bodenhamer Const. Co., Contoules Const. Co., Oakland & Piedmont, $82,730; Union Paving Co., San Francisco, $63,119; Heafey Moore Co., Oakland, $77,781; J. L. Conner, Monterey, $64,636; J. E. Haddock, Ltd., Pasadena, $76,058. Contract awarded to A. J. Raisch. $56,930.50.

SAN BERNARDINO AND RIVERSIDE COUNTIES. Between Calimessa and Banning, about 12.3 miles in length bituminous surface treatment to be applied to shoulders. District VIII, Route 26, Section A-A&B. Matich Bros., Elsinore, $5,927; E. L. Yeager San Bernardino, $4,990; C. O. Sparks, Los Angeles, $5,461; H. E. Cox & Son, Pasadena, $5,291. Contract awarded to Geo. Gardener & Sons, Redlands, $4,502.90.

SAN DIEGO COUNTY—Between Military Reservation and Canon Street about 1.9 miles to be graded and surfaced with bituminous macadam on crusher run base. District XI, Route 12, Section S.D. B. G. Carroll, San Diego, $47,405; Walter Trepte, San Diego, $53,647; Griffith Co., Los Angeles, $56,383. Contract awarded to V. R. Dennis Construction Co., San Diego, $43,862.00.

SAN MATEO COUNTY—Between Huron Street and San Pedro Avenue, in Daly City, about 1.7 miles to be

Highway Bids and Awards for November and December, 1934

(Continued from preceding page)

graded and paved with asphalt concrete. District IV, Route 2, Section DLC. Pacific States Construction Company, San Francisco, $207,528; Eaton and Smith, San Francisco, $213,225; Hanrahan Wilcox Corporation, San Francisco, $214,538; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $218,-451; The Fay Improvement Company, San Francisco, $228,917; Chas. L. Harney, San Francisco, $229,637; A. H. Raisch, San Francisco, $209,874. Contract awarded to Union Paving Company, San Francisco, $201,813.00.

SAN MATEO COUNTY—Between 3 miles east of Half Moon Bay and Summit, about 2.7 miles to be graded and surfaced with crushed run base and bituminous surface treatment applied, District IV, Route 105 & 55, Section A.B.C. Granfield, Farrar & Carlin, San Francisco, $155,177; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $163,111; Peninsular Paving Company, San Francisco, $165,653; Bodenhamer Const. Co., Contoules Const. Co., Oakland, $187,728; N. M. Ball & Harms Bros., Berkeley, $189,-140; A. Teichert & Son, Sacramento, $199,367. Contract awarded to Mittry Bros. Construction Co., Los Angeles, $149,865.00.

SANTA BARBARA COUNTY—Between Gaviota Creek & Nojoqui Creek. About 3.8 miles to be graded and paved with Portland cement concrete. Dist. V, Rt. 2, Sec. E.D. Sharp and Fellows Contracting Co., Los Angeles, $408,032; J. L. McClain, Los Angeles, $448,743; Gibbons & Reed Company, Burbank, $389,-123; Peninsula Paving Company, San Francisco, $401,-610; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $396,826; A. Teichert & Son, Inc., Sacramento, $441,991; Basich Brothers, Torrance, $423,917; Sander Pearson Co., Sparks & Mundo Eng. Co., Los Angeles, $376,780; J. E. Haddock, Ltd., Pasadena, $378,866. Contract awarded to Hanrahan-Wilcox Corporation, San Francisco, $375,983.25.

SOLANO COUNTY—Between Liberty Island Ferry and point 2 miles northerly about 2.0 miles to be surfaced with untreated crushed gravel or stone. District X Section—Liberty Island Road. Tiffany Const. Co., San Jose, $9,308; Hayward Bldg. Material Co. Hayward, $8,580; Ransom E. McCarty, Stockton, $9,100; Lee J. Immel, Berkeley, $8,528. Contract awarded to Henry Grimoldi, Napa, $8,008.

SUTTER COUNTY—Steel and concrete superstructure and parts of abutments of bridge across Tisdale Weir between Knights Landing and Meridian, consisting of 28-39'-0" and two 45'-9⅝" spans. District III, Route Feeder Highway. Lord & Bishop, Sacramento, $28,040; B. A. Hawkins & Co., San Francisco, $28,367; M. B. McGowan, Inc., San Francisco, $28,987; A. T. Howe, Santa Rosa, $29,030; Albert H. Siemer and Frank J. Main, San Anselmo, $29,376.00; C. W. Caletti & Co., San Rafael, $29,703; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $32,344. Contract awarded to P. F. Bender, North Sacramento, $27,023.00.

SUTTER COUNTY—Between 3 miles north of Knights Landing & Robbins, about 2.3 miles to be surfaced with crushed run base. District III, Route 87, Section A. J. B. Reeves, Sacramento, $24,795; Pacific States Construction Co., San Francisco, $24,-975; E. A. Forde, San Anselmo, $25,104; Hemstreet & Bell, Marysville, $25,319; Lee J. Immel, Berkeley, $25,887; Tiffany Construction Co., San Jose, $29,935; Southern California Roads Company, $34,045. Contract awarded to A. Teichert & Son, Inc., Sacramento, $23,917.75.

TULARE COUNTY—In City of Tulare, about 1 mile to be graded and paved with asphalt concrete. District VI, Route 4, Section Tul. A. J. Raisch, San Jose, $48,461; Union Paving Co., San Francisco, $43,-702; Stewart & Nuss, Inc., & John Jurkovich, Fresno, $49,303; A. Teichert & Son, Inc., Sacramento, $47,898; Valley Paving & Const. Co., Fresno, $36,658; Southern California Roads Co., Los Angeles, $44,677; Griffith Co., Los Angeles, $42,680; Hanrahan-Wilcox Corp., San Francisco, $46,334. Contract awarded to Basich Bros., Torrance, $34,202.50.

Modern girl's philosophy: Nobody loves a flat man.

Elimination of Grade Crossings Urged by Bay Magazine Editor

The present hazard at some 240,000 existing grade crossings of which only 30,000 are in some measure protected, will become a much more serious problem with the advent of high-speed trains which are gradually tending to replace the heavier and slower-moving steam propelled rolling stock.

Records show that there are about 2,000 fatalities yearly with three times as many injured by reason of accidents at grade crossing. Based on the value of a life to the State and insurance settlements a vital loss exceeding $80,000,000 occurs yearly.

Surely such a toll of life and monetary worth is worth the effort and money spent in a program of grade-crossing eliminations. To remove all highway-railroad crossings would entail about $2,400,000,000 and in the present national emergency it may be possible to allocate $1,400,000,000 from public works appropriations for these projects.

Grades can be separated at the most dangerous crossings and warning signals installed at the intermediate group. To round out such a complete program elimination of the minor crossings by closing obsolete county and other roads, which in a great percentage of cases is the cheapest, is also necessary.

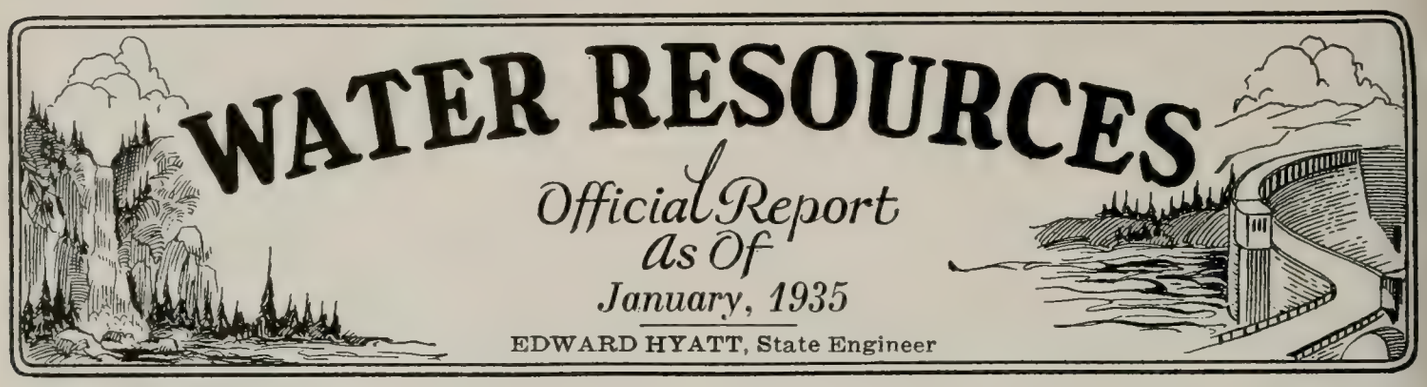
Grade crossing removals constitute a type of public works project that can be undertaken with a minimum amount of delay and red tape and, figuratively speaking, can be started on a minute's notice.

Let's remove the grade crossing—a relic of the horse and buggy days.—*Western Construction News.*

"Father" of Gas Tax Speaks

One of the sponsors of the original State gasoline tax, levied by Oregon in 1919, C. C. Chapman, editor of "The Oregon Voter," recently delivered an address in which he opposed diversion of gasoline tax revenues to other than highway purposes as a violation of a trust, and a breach of fair dealing with the public. He warned that all advantages of the gasoline tax plan of highway financing would be lost if the revenue were used for other purposes.

Mr. Chapman long has been interested in the development of highways, and was founder and chairman of the executive committee of the Oregon Roads and Development Association. With his associates he devised not only the gasoline tax method of financing State highways, but the idea of using revenue from other motor vehicle taxes, such as registration fees, for highway purposes. This idea, like that of gasoline taxation, now has spread to every State.



Reclamation projects employing S.E.R.A. labor under the direction of the Division of Water Resources provided 29,271 man-hours of work during the past month making a total of 100,662 man-hours of relief labor utilized to date on flood control work. Plans and specifications for enlargement of O'Shaughnessy Dam submitted by the city of San Francisco were approved and an application was received for appropriation of water from San Luis Rey River in San Diego County for irrigation of 9500 acres at a cost of $1,000,000.

News from irrigation districts, adjudications and other activities of the division are presented in the monthly report of the State Engineer as follows:

FLOOD CONTROL AND RECLAMATION

The several S.E.R.A. relief projects sponsored by the State Reclamation Board and this division, under the direction of this division, continued with the work of clearing flood channels. During this period a total of 29,271 man-hours of relief labor was utilized. The total man-hours of relief labor worked to date is as follows:

	Man-hours
Federal Transient Service, Upper Sutter By-pass	6,408
Federal Transient Service, Tisdale By-pass	720
Federal Transient Service, Lower Sutter By-pass	14,818
S.E.R.A. Project No. 35-B14-27, American River	35,318
S.E.R.A. Project No. 58-B14-15, Feather River above Marysville	27,740
S.E.R.A. Project No. 58-B13-35, Feather River south of Marysville	1,756
S.E.R.A. Project 57-B14-4, Sacramento By-pass	6,526
S.E.R.A. Project No. 35-B14-40, Mokelumne River	7,376
Total	100,662

During the period December 1st to 15th, an average of 288 men has been employed. In the same period the maximum number of men has been 461 and the minimum 134. Tools and facilities must be provided for the maximum number. It is expected that the average number working hereafter will be approximately 400.

Mokelumne River.

The clearing on the Mokelumne River By-pass was completed on November 27th under the relief project noted above, a total of 7376 man-hours having been employed. This work, together with previous work under CWA in both Sacramento and San Joaquin counties, completely clears the flood channel from Benson Ferry to New Hope Landing.

DAMS

During the month the following applications have been filed:

1. Application for approval of plans and specifications for the construction of the Mad River dam by the City of Eureka in Humboldt County. The dam is to be an arch structure 115 feet in height, to store 19,000 acre-feet, and estimated to cost $220,000.

2. Application for the repair of the South Lake Ranch dam belonging to the San Jose Water Works, located in the Santa Clara Valley. The application covers drainage of and additions to the fill.

3. Application for the alteration of the Phoenix dam, belonging to the Pacific Gas and Electric Company, located in Tuolumne County, was received December 13, 1934. The work proposed consists of the installation of upstream control works on the outlet conduit.

The application for the repair of the South Lake Ranch dam was approved on December 13, 1934.

Application for approval of the plans and specifications for the enlargement of the O'Shaughnessy dam, submitted by the City of San Francisco, was approved on November 22, 1934.

Construction is under way on the Vasona dam of the Santa Clara Valley Water Conservation District and is progressing satisfactorily.

Work on the placing of additional rock fill and timber facing on the San Gabriel No. 2 dam of the Los Angeles County Flood Control District is under way.

The main fill on the El Capitan dam has been completed and the spillway for the same is complete. Work on the lining of the outlet tunnel is under way.

Construction on San Gabriel Dam No. 1 is principally limited to the work in the cut-off trench as the Los Angeles County Flood Control District is considering submission of plans showing an altered design.

Big Canyon Creek dam in El Dorado County has been completed with the exception of minor cleaning up, etc.

The work on the enlargement of Williamson dam, which has been discontinued for some time, has now

Stream Flows Increased by Storms

(Continued from preceding page)

been resumed with a large construction force and it is expected that the work will be completed shortly.

The Orinda dam enlargement is complete except for the placing of a roadway surface on the fill.

Repairs to the Antioch dam are well under way. The work is being done as an S.E.R.A. project.

The usual inspections of maintenance to observe the condition of structures prior to the run-off season have been carried on in addition to the inspections of construction and repair work.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Except for maintenance of a few salinity stations and the Delta tide gages, the work under this project during the past month has all been in the office on the compilation of the 1933 and 1934 Water Supervisor reports. These reports will comprise the complete record of the diversions, stream flow, and return flow, throughout the Sacramento-San Joaquin territory and the upper Bay and Delta salinity investigations.

During the past month the flow of the Sacramento River at Sacramento has varied from about 8000 second-feet to a maximum of about 25,000 second-feet, resulting from the storm in the latter part of November. The salinity at all Delta stations has dropped to below 50 parts of chlorine per 100,000 and the sampling is being continued at only the sixteen stations on the upper Bay and in the Delta which are maintained permanently.

WATER RIGHTS

Thirty-seven applications to appropriate water were received during November, 11 were denied and 12 were approved. In the same period 14 permits were revoked and 8 passed to license.

Among the more important applications received during the month was one by Fallbrook Irrigation District seeking to appropriate from San Luis Rey River in San Diego County at a cost of $1,000,000 for the irrigation of 9500 acres and 8 applications by Nevada Irrigation District seeking to appropriate from Yuba and Bear rivers and tributaries in Nevada and Placer counties.

TOPOGRAPHIC MAPPING

In connection with the cooperative topographic mapping program carried on by the Division and the U. S. Geological Survey some progress was made during November in connection with control surveys in western Tehama and Butte counties.

The final sheet of the Coal Oil Canyon Quadrangle in Kern County is now available. This quadrangle was surveyed in 1931 and covers an area centering in and around the General Petroleum Corporation's Emigdio Pumping Station. The scale is 1:31,680, and the contour interval is 5 and 25 feet.

Final sheets of the Llano Quadrangle and advance sheets of the Hughes Lake, Bear Trap Canyon, Gorman and Black Mountain quadrangles in Los Angeles County are now available. This work was done by the U. S. Geological Survey in cooperation with Los Angeles County.

WATER RESOURCES

Report on the Mojave River Investigation was completed and will be available for distribution shortly after the first of the year. Although there have been several reports on phases of the Mojave River situation, this is the first in which the river is dealt with as a whole.

IRRIGATION DISTRICTS AND SECURITIES COMMISSION

During the month field examinations and reports were made on certain projects for which approval of expenditures had been requested by the following districts.

West Side—The proposed concrete lining of 5456 lineal feet of main and lateral canals to stop seepage and prevent the waterlogging of adjacent lands.

Citrus Heights—Replacement of one-half mile of 12-inch main service pipe line to supply increasing demands for water in a subdivided section at the north end of the district.

CENTRAL VALLEY WATER PROJECT

A meeting of the Water Project Authority of California was held in the office of the Attorney General, Sacramento, at 11.00 a.m. Chairman Earl Lee Kelly, Director of Public Works, presided.

A progress report was rendered by the Executive Officer on the status of the project and the Public Works Administration application before the Federal government; on recent Federal reports—H. R. Document, No. 395, and Natural Resources Board Report; on field investigation on economic aspects by Natural Resources Board; on necessity of adequate and competent representation in Washington, of need for cooperative assistance and effort on the part of the people of California, the Congressional representatives and the State Legislature and of the necessity for providing adequate funds for such purposes.

State Systems Total 382,668 Miles, With 32 per cent Pavement

DURING the past calendar year the State system mileage was increased 10,007 miles according to a report of the American Association of State Highway officials.

The total mileage on State Systems the first of this year was 382,668 miles. Pavements of all kinds are 112,941, being over 32 per cent of the total mileage. This is a gain of over 2 per cent from last year's reported gain. The remaining types of construction on the entire system with percentages are: Treated and low cost mix, 18 per cent (68,702 miles); untreated gravel and macadam, 25 per cent (97,150 miles); sand, clay or other types, 3 per cent (14,454 miles).

There are still remaining earth or unimproved mileages of 22 per cent. This is a gain of but 3 per cent in all classes of improved mileages over the total of last year, despite the fact that the increased mileage added to the system is not so great as that of 1932.

Owing to the increased mileage of unimproved roads added to the State systems the average percentage of dustless or better roads has decreased 1 per cent and now stands at 49 per cent of the total instead of 50 per cent last year. The average surfaced mileage of the State systems for the entire country is now 79 per cent. There is but one State 100 per cent dustless or better, although one is 99 per cent and one is 90 per cent. There are three States between 80 and 90 per cent and six States between 70 and 80 per cent. The other side of the picture shows that there are still nine States less than 25 per cent so improved.

Counting all surfaced mileages we find there are six States entirely out of the mud stage, and twelve more between 90 and 97 per cent so situated. Likewise, there are eleven States between 80 and 90 per cent surfaced. This is a big advance over last year in obtaining some kind of surfacing. Then there were but nine States with the entire system surfaced, now there are twenty-nine States with the entire system surfaced although some of it is but sand.

"Your car is at the door!"
"I know. I hear it knocking."

In Memoriam

WESLEY COOPER, employed for more than twelve years as an equipment operator by the Division of Highways, died on December 1, at his home in Grass Valley after a long illness.

Mr. Cooper was first employed driving truck on the test road in the vicinity of Pittsburg. From that assignment he was sent to Amador County in 1922, and subsequently was transferred to various locations in District III.

He was one of the large number of quiet, undemonstrative men whose faithful, conscientious efforts in every assignment exemplify the spirit of the maintenance forces in the field. His helpful attitude toward his fellow employees made him many friends.

He was born in Indiana and was 49 years of age at the time of his death. He is survived by his wife, Mrs. Maud Cooper.

Mr. Cooper served for three years in the United States regular army in the aviation corps and was stationed at Mather Field in Sacramento.

GASOLINE TAXES HAVE JUMPED 22,500 PER CENT IN 15 YEARS

Gasoline taxes per vehicle have jumped 22,500 per cent in the United States in the past fifteen years, and license fees have risen 48 per cent during the same period. These facts are shown by figures covering these taxes from 1919 to 1934.

In 1919, the first year of the gasoline tax, there were 7,565,446 motor vehicles on the roads, and the average annual gasoline tax paid by each was 13 cents. The average amount paid for license fees was $8.55. In 1933, 23,827,290 motor vehicles paid an average of $12.67 in license fees and more than twice as much more, $29.35, in gasoline taxes.

Dr. F. G. Crawford of Syracuse University recently stated that if gasoline taxes were paid all at once, like license fees, motorists would rebel at the size of the tax.

AUTO TRAFFIC INTO CANADA

Approximately 3,100,000 automobiles crossed the border into Canada during 1933, according to a report reaching the Automobile Club of southern California. This was the largest volume of tourist auto traffic across any international boundary ever recorded.

"When you go auto riding do you act quickly in a traffic emergency?"
"No, my wife stutters."

"Darling," asked the dumb bride making out the daily budget, "should the light bill be charged to 'current expenses'?"

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM ..... Governor

EARL LEE KELLY ..... Director

JUSTUS CRAEMER ..... Assistant Director

EDWARD J. NERON ..... Deputy Director

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DR. W. W. BARHAM, Yreka
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JULIEN D. ROUSSEL, Secretary

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FRANK B. DURKEE, General Right of Way Agent
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DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

17479 1-35 10M

CALIFORNIA STATE PRINTING OFFICE
HARRY HAMMOND, STATE PRINTER
SACRAMENTO, 1935

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

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Snow Plow Clearing the Tahoe-Ukiah Lateral

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2,950 Miles of Highway Improvements in 19 Months is Record of this Biennium

Construction and Maintenance Work put Under Way by February 1st Totalled $46,816,500 of Federal and State Funds, Completing 78% of Program in 79% of Two Year Period

By **GEORGE T. McCOY,** Assistant State Highway Engineer

THE CURRENT biennium, including the eighty-fifth and eighty-sixth fiscal years of California's statehood, has seen the greatest activity in highway construction in the history of the State. State funds available for road improvement have been augmented by Federal appropriations, with the result that an unprecedented construction program on the tSate highway system has been possible.

As one of the outstanding methods in the national program for the relief of unemployment, the Federal Government established the policy of intensive public works construction. As a unit in this policy, under the 1933 National Industrial Recovery Act, Congress appropriated $400,000,000 as Federal aid to the various States for construction on State highhighway systems, between July, 1933, and July, 1934. Under the Hayden - Cartwright Act an additional $200,000,000 was appropriated for apportionment to the States to carry the construction program on to June 30, 1935. After this date regular Federal aid apportionments under this act will become available.

GEORGE T. McCOY

Of these two appropriations California was apportioned $15,607,354 under the NIRA and $7,932,206 under the 1935 grant of the Hayden-Cartwright Act.

The acts appropriating these amounts contained provisions which required the various States to furnish the necessary rights of way, assume preliminary engineering costs, etc., which will approximate $3,800,000 of State highway funds in California in order to make the Federal grants available. Further provisions of the act provided for a wide distribution of the funds.

In selecting projects, cognizance had to be taken of the time element so that right of way negotiations, difficult engineering problems, and other factors involved would not delay the placing of the work under contract.

These two apportionments from the Federal Government, together with $18,475,000 in State funds, have provided the Division of Highways with a major construction budget totaling $42,284,600 for the eighty-fifth-eighty-sixth fiscal years (July 1, 1933, to June 30 1935). With nineteen of the twenty-four months in the biennium past, construction projects in the amount of $32,873,800 have been put under way or are now advertised for bids. Thus during 79 per cent

(Continued on page 10)

State Crews Keep 4,500 Miles of Roads Open During Worst Storm in 12 Years

By **GEORGE F. HILLESOE** and **NELSON T. BANGERT,** Assistant Maintenance Engineers

AFTER having enjoyed a winter of exceptionally light snowfall last year, the maintenance forces of the State Division of Highways were once again pressed to the limit in keeping snow area routes open to traffic. Exceeding in intensity and area any storm experienced since the department inaugurated the policy of keeping open all important roads, the "season's worst storm" started on January 7, reached its peak between January 13 and 18, and did not subside until January 20.

The range of the storm was exceptional, with four inches of snow falling at Eureka, where a measurable depth is seen only once in a generation, to a maximum fall at "Old Reliable," Donner Summit, where in four days the snow pack was increased by 88 inches. The manner in which the men of the fighting forces responded to the emergency in conquering the "Snow King" is indeed a credit to the organization and must in all sense give them the satisfaction of a job well done.

The following abstract from a district report of the storm amply characterizes the manner in which the employees responded:

"During the storm, superintendents, foremen, and leadingmen lost all track of days and hours. Truck drivers and equipment operators took their equipment out and kept it moving until a round trip was made, or until they were relieved."

WORST IN TWELVE YEARS.

The storm, conceded in places to be the worst in twelve years, was general throughout the State, and deposited snow in measurable depths to the 1200-foot level in the north and to the 4000-foot level in the south. Adding to the fierceness of the storm was the accompanying wind, more particularly in the Sierras and the east of the Sierra region, reaching at times a hurricane velocity of 60 miles an hour. Coupled with temperatures which in places ranged to 30 degrees below zero, the storm, for a time, gave the State more of the arctic touch than is attained in ordinary winters.

Fortified with the best layout of equipment yet available since the advent of snow removal, totalling some 293 pieces, and ranging from "V" push plow motor graders to large auger-blower type rotaries, the department was able to keep open to traffic 4500 miles of road on which the snow pack reached a foot or more in depth. In addition, many tow graders, tractors, and power graders were pressed into the service of clearing lighter falls.

A CONTINUOUS PERFORMANCE

Equipment was not allowed to stop, operation being continuous in places for as much as 175 hours, with only time out for servicing. A vital help during the emergency was the equipment purchased last fall to replace obsolete units. Broken equipment was repaired and put back into operation with the least possible delay, repairs at times being made at night in a snow bank with only the aid of a flashlight.

As usual, the greatest trouble was experienced at points unprotected by forest or snow fence. Howling winds re-formed drifts on roads almost as rapidly as they were cleared. The value of the drift fence already installed was very evident and demonstrated the necessity of additional installations.

In District I, where ordinarily snow removal is a minor problem, the snowfall reached a maximum of 104 inches on Oregon Mountain, a record fall for that location. In the heavy timbered areas, the weight of snow brought down many large trees which further impeded snow removal operations. Along Willow Creek, 62 trees fell across a two-mile section of highway. Some of these trees were of such size as to necessitate the use of powder in their removal.

SNOWED IN SEVENTEEN DAYS

Except for a small area in Tehama County, snow removal was necessary on all highways in District II. While the snowfall did not in any place reach record depths, the storm was unusual in that snow fell every day from January 3 to January 20. The greatest trouble was experienced in the high-plateau sections east of the mountains, where high winds and resulting drifts were responsible for the blocking of several roads for short periods.

(Continued on page 28)

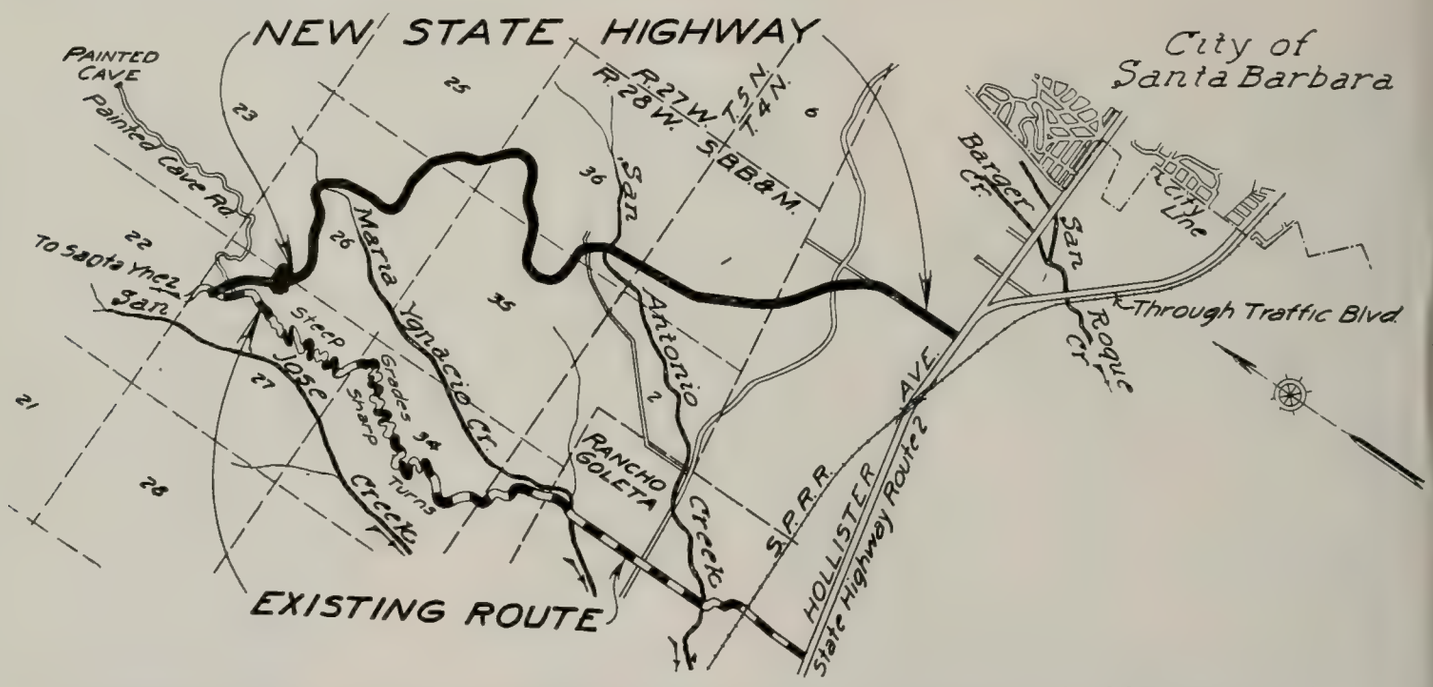
SNOW-FIGHTING CREWS AND EQUIPMENT did valorous work in keeping the highways open during the 20-day January storm that attained blizzard proportions in the mountain areas. Nos. 1 and 2—big rotary plow working on State Route 38 near Homewood, Placer County. No. 3—Clearing the Tahoe-Ukiah lateral between Nevada City and Bear Valley. No. 4—Disposing of a 6-foot fall between Dunsmuir and Mt. Shasta City.

Building a Highway Over Santa Ynez Range Via Historic San Marcos Pass

By **H. L. COOPER,** Acting District Office Engineer

ALONG the rugged, steep slopes of the Santa Ynez mountain range immediately north of the city of Santa Barbara, the historic old San Marcos Pass Road is being reconstructed largely on new alignment. One of the most scenic and interesting secondary routes along the coast the very steep grades and many sharp turns have long discouraged its use as an alternate mountain route to the Coast Highway through the city.

When the improvement now under way is completed, together with the proposed work in the vicinity of Los Olivos and the little mission town of Santa Ynez, the motorist will have available an alternate route of easy grades and curves, some ten miles shorter than the Coast Highway and replete with beautiful panoramas of mountain and coast scenery.



MAP SHOWING ROUTE of San Marcos Pass realignment as compared with present route

CROSSES MOUNTAIN RANGE

Known as State Route No. 80, the San Marcos Pass Road was taken into the State system in 1931. It extends northerly from the Coast Highway at a point about two and one-half miles west of Santa Barbara City and follows up a steep ridge on the southern slope of the Santa Ynez Range. Crossing the top of the range through San Marcos Pass, the road thence follows down the Santa Ynez River Valley and through the small communities of Santa Ynez and Los Olivos, rejoining the Coast Highway at Zaca, about fifty miles north of Santa Barbara.

According to our early California history, it was through this San Marcos Pass and down the southern slope of the mountains that, on Christmas Day, 1846, General Fremont led his small band of soldiers through rain and mud to the capture of Santa Barbara, while the Spanish defenders lay in ambush for him farther westward at Gaviota Pass.

PANORAMA OF SEA AND CITIES

In addition to affording a mountain short-cut route, this road serves a large and popular vacation and recreational area for the residents of Santa Barbara and vicinity as the near-by canyons contain numerous summer homes and cottages. From points high up on the mountain range, the motorist is afforded delightful views of Santa Barbara and neighboring communities and looking westward, across the ocean, he may behold the distant Santa Barbara Islands.

(Continued on page 15)

SAN MARCOS PASS CONSTRUCTION SCENES. At top a scraper is working on a preliminary fill leading to two 100-foot cuts seen in background. Center picture shows a 100,000 cubic yard fill nearing completion. The bottom view shows three scrapers and a 75 horsepower bulldozer in operation on one of the 100-foot cuts, illustrating the heavy grading work required on many portions of this rugged mountain terrain where a realignment of the existing steep and tortuous highway is now in progress.

Ramona Boulevard a 6-Mile "Airline" Urban Route Without Grade Crossings

By **R. C. MYERS,** Assistant Engineer, District VII

WITHIN the next few weeks the new Ramona Boulevard highway entering Los Angeles from the east will be completed, thus providing traffic with an "airline" entrance from Monterey Park and points east into the Civic Center of Los Angeles.

This project is the final connecting link of the Los Angeles-Pomona route on which construction was begun in 1932 and by which traffic from San Bernardino, Redlands, Riverside and the Imperial Valley aggregating more than 20,000 cars per day, according to traffic studies, will be saved $876,000 annually in operating costs—an amount sufficient to pay the construction cost of the entire route in less than two and a half years.

ways and direct connections with only a few relatively unimportant streets. It will be the first highway permitting such an uninterrupted flow of traffic so near the business center of Los Angeles.

All previously existing routes from Los Angeles to Monterey Park were through a maze of heavily traveled intersecting streets and railroad crossings in the industrial district, with the consequent hazard and delay to traffic.

The new route follows along the southerly side of the Pacific Electric Railway Covina line to a point outside the city limits of Los Angeles. From this point it cuts across the Midwick Country Club grounds to connect with the westerly end of Garvey Avenue near its intersection with Atlantic Boulevard.

MAP SHOWING ROUTE of new Ramona Boulevard through Los Angeles area.

The Ramona Boulevard link of State highway route 26, as this route is officially known, starts at the intersection of Aliso Street and Mission Road, about three-fourths of a mile east of the Civic Center of Los Angeles, from which intersection connection is made to the Civic Center on Aliso Street.

FREE OF GRADE CROSSINGS

This new boulevard will extend for nearly six miles to Monterey Park having no grade crossings with either railroads or main high-

FIVE EXISTING BRIDGES

The advantage of locating the new highway along the Pacific Electric Railway tracks is twofold. In the first place this is by far the best and most direct alignment which can be secured through this section of Los Angeles and in the second place it follows a low canyon where all important cross streets now have bridges over the railroad tracks and yards and new structures can be built to carry

(Continued on page 20)

ALONG THE RAMONA "AIRLINE" HIGHWAY between Monterey Park and Los Angeles. The top view shows a section of the roadway on the grade separation where the new highway crosses Coyote Pass road near Monterey Park. Traffic going southwesterly into Coyote Pass is diverted and passed under the new highway by the road at the left of the picture and thus avoids a right hand turn. The center picture is a view of the long, wide straightaway approaching the concrete bridge that carries Eastern Avenue over the new highway and the Pacific Electric tracks. At bottom is a typical section paralleling the railroad showing the 40-foot pavement, wide oiled shoulders and curbing of this 6-mile stretch of high standard arterial without a grade crossing over which more than 20,000 cars will enter the Los Angeles Civic Center area.

Julien D. Roussel Takes Office as Secretary of Highway Commission

JULIEN D. ROUSSEL, the newly appointed Secretary of the California Highway Commission was born in New York City, descending from a distinguished Huguenot family on his father's side and from early Dutch settlers (the Van Der Veer family) on his mother's side.

His education was secured in the public schools of New York City. He entered the business world early in life, spending his early business years in his home city as secretary to the late James B. Regan, owner of the famous Hotel Knickerbocker, and later with other prominent hotels, including the famous Rector's.

He was active for years in Republican circles in his home State being closely identified with the late George W. Perkins and Col. George Harvey in the celebrated 1916 presidential campaign, during which he was secretary to the candidate, Charles Evans Hughes. Following the campaign, Mr. Roussel assisted in raising the $5,000,000 endowment fund for the Lincoln Memorial University, for mountain whites, located at Cumberland Gap, Virginia.

JULIEN D. ROUSSEL

DECORATED IN WAR SERVICE

At the outbreak of the war, Mr. Roussel joined the colors and served with distinction in France as a corporal in Company "A," 304th Machine Gun Battalion. For gallantry in action at St. Pierremont, France, he was cited twice in General Orders of his Division and was awarded the Order of the Silver Star, with palm. He also was awarded the Verdun Medal by the French Government, and holds the New York State Honor Medal, together with Victory Medal with three bars.

After his honorable discharge from the Army, he came west to Long Beach, California, which has since been his home and where he has taken a leading part in all civic matters.

After a few years service with the Los Angeles TIMES, he was appointed by the Secretary of State, Charles Evans Hughes, to the United States Foreign Service and assigned to the American Consulate at Smyrna, Turkey, where he served for several years, being transferred later to the consulate at Prague, Czechoslovakia.

ACTIVE IN CIVIC AFFAIRS

Returning to Long Beach, California, in 1928, Roussel entered the employ of the Union Pacific System and remained there as director of the Travel Bureau until 1932.

Since then he has been active in Republican circles in southern California and is well known to most of the prominent leaders in the State.

He is keenly interested in the development of California's highway system and believes that such development can be furthered by the success of Governor Merriam's highway program.

Mr. Roussel is single and resides at the Sutter Club, Sacramento.

A teacher tells of an excuse which the mother of one of her pupils sent in the other day. The excuse read: "Please excuse Charles. He got wet in the a.m. and was took sick in the p.m."

Supreme Court Decision Greatly Aids Central Valley Water Project

THE State Supreme Court, on January 31st, rendered unanimously an opinion of transcendent importance in the conservation of the waters of the State.

The decision is most timely in clarifying the water law of the State in advance of the commencement of actual work on the great Central Valley water project.

By this opinion, written by Justice Shenk in the case of *Peabody et al.* vs. *Vallejo,* the Supreme Court declared it to be the policy of this State to conserve its life-giving waters and to put them to beneficial uses.

The court has repudiated the doctrine formerly prevailing and established for over fifty years, which permitted the riparian owner to insist, even though he could not beneficially use the water, that the same must flow past his land, unused and wasted, into the sea.

CONSTITUTIONAL AMENDMENT UPHELD

The decision embodying the new doctrine was made possible by an amendment to the State Constitution passed in 1928, declaring it to be the policy of this State "that the water resources of the State be put to beneficial use to the fullest extent of which they are capable."

In the *Peabody* case, certain riparian owners along Suisun Creek, in Solano County, sought to enjoin the city of Vallejo from impounding the waters of Garden Valley Creek, a tributary of Suisun Creek. The city desired to impound the waters to create a municipal water supply and claimed it could impound such waters without materially injuring the riparian owners.

The riparian owners claimed the right to the full flow of the stream, even while conceding that the larger portion of the waters flowed ultimately into San Francisco Bay. They sought to show that the weight of the full flow of the stream pressed small quantities of water into the strata underlying their lands.

WASTEFUL USE BANNED

Some of the riparian owners claimed the right to the full flow of the stream for the purpose of flooding their lands and depositing silt thereon. Others desired to use the full flow of the stream to flood their lands to wash out the salt content in the soil. In no uncertain language the court held that such a wasteful use of the water could no longer be countenanced.

The court recognized that the riparian owner is entitled to full protection of his right to use the water for any reasonable beneficial purpose and for any future beneficial use, but unequivocally held that beyond that the right of the riparian to prevent any one else from using the water no longer existed in this State.

The decision culminates the struggle that those who have desired to conserve the waters of the State have waged for many years, but were prevented by legal limitations, which, under the old law, prevented the impairment of the riparian right. In 1926, in accordance with the then existing law, the Supreme Court decision in the *Herminghaus* case, virtually gave to the riparian owners complete control of the waters in the streams of this State.

Largely as a result of that decision the Constitution was amended in 1928 as above indicated. The Supreme Court promptly acted under this new constitutional authority and, in the case of *Gin Chow* vs. *Santa Barbara,* rendered several years ago, gave the first indication that the constitutional amendment could be interpreted so as to preserve to every water user every legitimate right, but so as to prevent any owner from insisting on the waste of huge quantities of water yearly.

The decision points the way to the manner in which the waters of this State, particularly in the semi-arid regions, may be conserved, and eliminates many of the legal difficulties which would otherwise have arisen in such projects as the Central Valley water project.

In behalf of the State, briefs were filed by Messrs. Spencer Burroughs and Henry Holsinger, attorneys for the Division of Water Resources, as "friends of the court" on behalf of the division, and C. C. Carleton, chief attorney, Department of Public Works.

Biennium Records Outstanding Work

(Continued from page 1)

of the biennium, 78 per cent of the programmed construction has been completed or set in motion.

It is anticipated that with the present speed of the division in advancing projects to bids, the remaining 22 per cent of construction projects will be under way before July 1st.

MAINTENANCE KEEPS PACE

Progress during the biennium on maintenance work has paralleled that of construction, and by February 1, 1935, work orders amounting to approximately $13,942,700 had been written, leaving only some $3,779,300 of the $17,722,000 originally budgeted for maintenance and betterments during the biennium.

The following summations set forth in tabular form the figures given above:

CONSTRUCTION AND MAINTENANCE BUDGET

State funds	$18,745,084
NIRA apportionment	15,607,354
Subtotal (Legislative budget)	$34,352,438
Hayden-Cartwright Act apportionment	7,932,206
Total construction budget	$42,284,644
Maintenance and betterments—(Legislative budget)	17,722,000
TOTAL	$60,006,644

CONSTRUCTION AND MAINTENANCE TO FEBRUARY 1, 1935

Construction put under way	$32,590,400	
Projects advertised for bids	283,400	
	$32,873,800	
Projects to be advertised before July 1	9,410,800	
TOTAL CONSTRUCTION		$42,284,600
Maintenance and betterment allotments	$13,942,700	
Remaining for maintenance	3,779,300	
Total maintenance and betterments		$17,722,000
TOTAL		$60,006,600

The value of permanent improvement to the State highway system accomplished by the $32,873,800 allotted for construction may best be judged from the following summary of work put under way and advertised since July 1, 1933:

Type of Improvement	Miles	Amount
Permanent type pavement	286.3	$12,390,400
Bituminous treated crushed rock surfacing	239.8	4,523,500
Untreated crushed rock surfacing	56.6	996,400
Graded roadbed	225.8	6,100,100
Oiled roadbed and shoulders	2,141.4	1,394,800
Bridges and grade separations	(113)	4,847,700
Miscellaneous contracts	*(1,495.3)	600,700
Minor improvements	---	671,800
Miscellaneous day labor	---	1,348,400
Totals	2,949.9	$32,873,800

* Traffic stripe (not included in mileage total).

To advance this great program has required the persistent and unified effort of the entire State highway organization. Early in the biennium an intensive construction program was put under way with the call for bids on August 25, 1933, for fifty State highway contracts aggregating more than $4,000,000.

THOUSANDS PUT TO WORK

While the work during the ensuing months did not entail the high pressure which attended the months of August and September, 1933, nevertheless a large number of contracts have been prepared, advertised, and awarded since that time with the result that the great amount of work listed above has been accomplished and the desired result of putting thousands of Californians to work has been attained.

To those outside an organization such as the Division of Highways, it is difficult to realize the vast amount of work necessary to put under way a construction program of the magnitude of the one now nearing completion. Each project, large or small, requires careful planning, consisting of comprehensive surveys in the field; expert design of the proposed work; accurate computation of quantities of materials and work involved; preparation of drawings and plans; writing and assembling of specifications; tests of proposed materials and the settlement of negotiations for the required right of way.

COORDINATED EFFORT REQUIRED

Each of these portions of the work requires time and the labor of men with technical training and experience. The executive staffs in the highway districts and central office organization of the division must schedule

Large Construction Projects Under Way in Southern California

(Continued from preceding page)

and dovetail the work so that the many phases may be consummated in proper order and the preparation of the projects for contract accomplished with a minimum of delay.

That the Division of Highways has put under way so great a volume of work and is advancing down the last few months of the biennial period, assured of accomplishing its task, in itself, speaks for the loyal support and cooperation of the individual members of the organization. The funds supplied by the State and Federal governments for highway construction as a means of relieving unemployment and the efforts extended by the division have made these funds available to the many thousand Californians who have been employed on construction throughout the entire State.

U. S. BUREAU VALUABLE AID

In the administration of the National Industrial Recovery Act and the Hayden-Cartwright bill, the Secretary of Agriculture through the U. S. Bureau of Public Roads was assigned the task of approval of various States' programs, plans and specifications for individual projects, checking of progress estimates payable to contractors and other functions. This Federal agency, through its many years of experience in highway construction, its efficient and well-manned organization, rendered valuable assistance and the closest cooperation to the State in placing the program under way and following the multitude of contracts through to completion.

SOME OUTSTANDING PROJECTS

Some of the larger and more important construction projects which the activity of the division has accomplished for the citizens of California during the biennium may well be listed here.

The Ridge Route alternate, which eliminated the notorious and crooked Ridge Route from the Los Angeles-Sacramento arterial, was completed, as was the construction of the new section of the famous Redwood Highway between Cloverdale and Hopland in Sonoma and Mendocino counties, and an important part of the Redding-Alturas lateral in Lassen and Modoc counties.

In the San Francisco Bay area, construction of the approaches to the mammoth Bay Bridge was begun; five miles of San Pablo Avenue in Oakland, Emeryville, Berkeley, Albany and El Cerrito were widened and paved; construction on the Bay Shore Highway was extended southerly and a portion of the crooked route through the Santa Cruz mountains between Los Gatos and Santa Cruz eliminated by the completion of the new road between Inspiration Point and Scotts Valley.

MAJOR COAST IMPROVEMENTS

Along the coast, the Redwood Highway is being improved by drastic realignment involving heavy grading in Del Norte and Humboldt counties, construction on the Carmel-San Simeon Highway in Monterey County has been materially advanced by both road and bridge contracts, reconstruction of the Coast Route has also been started on the realignment of the notorious Nojoqui Grade in Santa Barbara County and on the section in Ventura County between the Ventura River and the Santa Barbara County line.

In Southern California work on State Route 60, locally known as the Roosevelt Highway has been, and still is, in progress on many sections, including Santa Monica, Torrance to Long Beach and along State Street in Long Beach. The construction of the Firestone Boulevard (Manchester Avenue route between Los Angeles and Anaheim) is nearing completion; and improvement of the

(Continued on page 14)

TRUCKMEN JAILED FOR USING HIGHWAY POSTS TO MAKE A CAMP FIRE

Maintenance Superintendent Glenn H. Cheeseman of Saugus reports that as he was proceeding up the Ridge Route Alternate on the morning of November 26, he found that three 8" x 8" x 5' 4" highway sight posts had been slashed in two for firewood, just as a tree would be cut down for such a purpose. Looking across the road he discovered a truck with two men sleeping around the remains of a fire. He awakened them and told them they were under arrest and that they would have to go to Newhall with him. He permitted one of the men to stay temporarily to guard the loaded truck but took the other in before Justice of the Peace Kennedy, who listened to the story and assessed a fine of $25 and 12½ days in jail. The justice sent one of his officers out and brought in the other man who was similarly fined and imprisoned.

The truck driver 'phoned for bail money and was released. The owners of the truck were billed for the damage.

Aerial Wheels Shuttling Across Bay Will Spin Cables For Big Bridge

WITHIN a month a wire rope will be drawn across a mile of water between San Francisco and the concrete center anchorage of the San Francisco-Oakland Bay Bridge midway to Yerba Buena Island. This wire rope will be raised to the tops of Towers W-2 and W-3, and will be the first support of the first of the two catwalks to be built over the bridge tower tops preparatory to spinning the cables of the first of the twin suspension bridges between San Francisco and Yerba Buena Island.

State Director of Public Works Earl Lee Kelly, and perhaps Governor Frank F. Merriam, chairman of the California Toll Bridge Authority, will be with Chief Engineer C. H. Purcell to witness the stretching of the first connection between these two towers of the San Francisco-Oakland Bay Bridge.

This wire rope will be drawn across by a reel barge of the Columbia Steel Company, laid in the water, and then elevated to its place by means of derricks on the tops of the towers.

FOR TEMPORARY CATWALKS

A mesh of steel will be laid between four such cables which, with hand rails, will constitute the temporary catwalk upon which State engineers, inspectors, and workmen will string the 17,464 parallel steel wires which comprise one of the two cables which will eventually support the double-deck San Francisco-Oakland Bay Bridge over the West Bay crossing.

After the construction of this catwalk an endless cable will be erected with two 5-foot diameter spinning wheels attached to it. At this time the contractors will move 16-ton spools of cable, each holding sixty miles of wire, to the Rincon Hill anchorage, San Francisco, and the concrete center anchorage in the midwest bay.

These spinning wheels will be shuttled swiftly (perhaps 600 feet per minute) across the mile course between Rincon Hill and the center anchorage, over the tops of the towers in the same sweeping curves and deflections that will characterize the final cable.

The amount of the deflection, or curve, in the wires thus strung by the shuttling wheels will be determined by a guide wire set in place and measured carefully. This guide wire will be drawn many feet higher in the sags than the final cable. This is done so that the weight of the cable will cause it to sag into accurate position.

Calculations made in advance by Chief Engineer Purcell's staff foretell the amount of increase in the sag of the completed cable over the first few wires. Accordingly Chief Engineer Purcell expects to be able to spin these wires so that the weight of the final keg-sized cable of 17,464 wires will bear it down to the exact height required.

The increased sag of the completed cable will be brought about by the elasticity of the steel wire cable and the bending of the towers, which were built sufficiently out of perpendicular so that this added weight will correct the towers' unloaded positions.

WORKED OUT IN ADVANCE

The elasticity of steel, which stretches with less damage to its body than rubber if kept within the limits of its tensile strength, is carefully calculated and accounted for in all these operations. Nothing, Chief Engineer Purcell points out, is left to be worked out on the job, everything being worked out on the blue prints in advance.

And this, the West's first view of major suspension bridge building, will take place during the year 1935 in the West Bay.

In the meantime during this year, the East Bay crossing will be practically completed save for a gap of 576 feet in the center of the 1400-foot cantilever span over the navigable portion of the East Bay waters, just east of Yerba Buena Island.

Fourteen deck-truss spans have already been completed in the East Bay crossing, and the year 1935 will see the five through-truss 500-foot spans erected, together with the four Yerba Buena Island deck-truss spans and the anchor and cantilever arms of the 1400-foot cantilever—in fact, all of the East Bay crossing save the suspended portion in the middle of the cantilever span.

Through Yerba Buena Island a horseshoe-shaped bore will have been completed early

(Continued on page 21)

"STEPPING STONES" for the World's greatest bridge. In the foreground are seen the pier foundations for the East Bay crossing extending to Yerba Buena Island with a view of a traveling derrick erecting the last of the 288 foot spans of the Oakland shore superstructure. Erection of span YB-1 on Yerba Buena Island is in progress and beyond the island is seen the entire West Bay Crossing, with Tower W-5 under construction and the city of San Francisco in the background.

3,000 Given Part-time Relief Work

(Continued from page 11)

Ramona Boulevard section of the Los Angeles-Pomona lateral, with its numerous highway grade separations, has been a feature of the biennium.

Reconstruction of the Santa Ana Canyon Road in Orange County, the Jackrabbit Trail in Riverside County and the new viaduct across the yards of a railroad at the entrance of the Foothill Boulevard into San Bernardino are all important improvements.

HEAVY GRADING CONTRACTS

Heavy grading has been undertaken on the Tehachapi lateral in Kern County between Bakersfield and Mojave and on the Fresno-Yosemite route in Madera County.

Two of the most important projects begun during the biennium were the construction of the American Canyon route between the Carquinez Bridge and Cordelia and the massive steel bridge across the Sacramento River at the westerly entrance of the Capitol City. Both of these improvements are on the San Francisco-Sacramento arterial.

Other large projects of the biennium include the construction of a bridge across the Sacramento River at Redding on the new alignment of the Pacific Highway through that city; the beginning of work on the Susanville-Reno road at the State line, and the completion of the easterly connection of the Ukiah-Tahoe lateral with the Sacramento-Truckee road near Emigrant Gap in Nevada County.

MILEAGE ADDED TO SYSTEM

The current biennium has seen many changes which have been of vital import to the people of the State in relation to their State highway system. Laws enacted by the 1933 Legislature affected the extent of the highway system, the use of funds and construction and maintenance procedure.

The addition of approximately 6700 miles of county roads to the State highway system on August 22, 1933, nearly doubled its extent, raising the mileage from 7300 to more than 14,000 miles.

The allocation of one-fourth cent of the State's 2-cent share of the 3-cent gasoline tax to incorporated cities altered the financial set-up of the division.

The greatly increased mileage of the State system presented the maintenance department with the problem of organization readjustment, which has been ably met with a spreading of territory under the jurisdiction of superintendents, and a minimum outlay for additional equipment.

Maintenance crews were augmented by part time employment providing relief on the basis of a forty hour week, working alternate weeks.

Funds provided for this purpose by the California Highway Commission have been so judiciously expended for employment on part-time crews that approximately 80 cents of every dollar spent on the much needed upkeep of State roads performed by these part-time crews has been paid out in wages to the men. Approximately 3000 men have been kept at work half time for about fifteen of the nineteen months which have passed since the beginning of the biennium.

With this brief panorama of the activities and accomplishments of the Division of Highways in mind, a glance at the position which California holds in respect to the other States of the Union, as shown from statistics compiled in 1934 by the American Association of State Highway Officials, may be of interest.

CALIFORNIA STANDS FIFTH

The cost to the California motorist was only $5.04 per motor vehicle for license fees and $17.98 per motor vehicle for gasoline tax. In this regard our State is outstanding, ranking forty-sixth in the lowness of fees and forty-first in low average cost for gas tax. The average motor vehicle fee for the country was $12.70 and the average cost per motor vehicle for gasoline tax was $21.80.

The following tabulation shows California's rank in regard to road mileage:

	California Miles	Rank	Total miles in United States
All roads (outside cities)	77,085	18	3,065,254
State highway system	14,019	5	413,268
Miles on State system improved	13,551	4	335,108
Miles pavement on State system	6,665	4	113,564

"HAIRPIN" CURVES ON SAN MARCOS PASS road soon to be abolished by realignment. A beautiful ocean panorama is afforded at this point embracing the Santa Barbara Channel Islands shown by dark line at top of picture.

BUILDING A HIGHWAY OVER SANTA YNEZ RANGE

(Contitnued from page 4)

With the exception of the lower one and one-half miles, the old road is very crooked with several hairpin turns on grades over 20 per cent and requires second gear travel over certain sections.

The new road now under construction for a length of 5.8 miles is a complete realignment and in general lies about one mile easterly from the old road. The junction with the Coast Highway (Hollister Avenue) is about one and one half miles closer to Santa Barbara than the old intersection, and lies only 1100 feet west of the intersection of the recently completed Santa Barbara through traffic boulevard.

Maximum grade is 6.6 per cent with a general ruling grade in the mountainous stretch of about 5 per cent. The road is of standard 24-foot width with an added two feet each side on fills to accommodate a protective dike and still afford an effective 24-foot roadbed width.

Wherever practical, daylighting of cuts has been resorted to in order to give greater sight distance and for scenic purposes. Surfacing at the present time will consist of oil mixing the local material and seal coating the surface.

In addition to the heavy grading on the project, 894,000 cubic yards in 5.8 miles, several large drainage structures are being built. Across San Antonio Creek a combination timber and concrete bridge 192 feet long with a 24-foot clear roadway, consisting of eight standard 19-foot timber spans and one 40-foot concrete and steel girder span is being constructed. Also three large reinforced concrete arch culverts under heavy fills are included in the contract, the largest of these giving 102 square feet of opening, is at Maria Ygnacio Creek.

The project is being financed entirely from State funds at a cost of about $420,000.00 and is scheduled for completion in October, 1935.

International Pacific Highway Means Great Trade Channel For California

By **JUSTUS F. CRAEMER,** Assistant Director of Public Works

THE International Pacific Highway, which President Roosevelt has stressed as a most important project, extends from Fairbanks, Alaska, along the Pacific slope to Santiago, Chile, and thence across the Andes to Buenos Aires. It will have a length of more than 13,000 miles and will be the longest, continuous motor road in the world.

It is in large part in existence today for of its total length 2300 miles are paved, 879 miles surfaced with lower type material and 2032 miles graded. In addition to the above, there are 5780 miles of trails over which automobiles may be driven in dry weather.

The highway as now completed or projected traverses twelve republics of Latin America, four States of the United States of America, British Columbia and the territories of Yukon and Alaska. The combined area of these political subdivisions served by this highway is 5,107,725 square miles and the population is in excess of 63,000,000.

EXTREMES OF ELEVATION

The highway will reach a minimum elevation of 52 feet below sea level in the Imperial Valley of California and a maximum elevation of more than 14,000 feet in the Andes. More than 50 per cent of the total length will lie at an elevation of over 5000 feet above sea level, yet the climate of the entire region traversed, if the extreme northerly end is excepted, is mild or semitropical and conducive to all year round travel.

The Panama Canal will be crossed on modern power-driven ferries now installed and in operation. Loading and unloading ramps are provided on each side of the canal which rise and fall with the tide.

The writer, less than a year ago, in an interview with the then President of the Republic of Mexico, General Rodriguez, learned that the highway program of the sister republic to our south, provides for the completion of its first international route to the boundaries of the United States this Spring. This all hard surface route will lead from Laredo, Texas, directly to Mexico City, where it joins the West Coast branch of the

JUSTUS F. CRAEMER

International Pacific Highway scouted by the Automobile Club of Southern California several years ago.

The other major highway project of Mexico is that of the West Coast route from Nogales, Ariz., to Mexico City. The improvement of this highway with modern hard surface for its entire length is in process and will require several years more for final completion because of the heavy grade work through the baranca area between Tepic and Guadalajara.

OPENS NEW FRONTIERS

The international Pacific Highway will open up a new frontier for tourist travel and will make accessible by automobile a vast wonderland of historic and scenic attraction. As the motorist proceeds southerly from the United States, he will meet a new and hospitable people. Native costumes and primitive life will add color to the ever-changing

Latin America Seeking Tourist Travel

(Continued from preceding page)

panorama which unfolds before him.

He will find a land of amazing contrasts, Christian temples built upon the ruins of pagan shrines, modern cities built around and upon the ruins of ancient civilizations, active volcanos and mountain peaks reaching elevations of almost 20,000 feet. He will see beautiful lakes and cross many broad and stately rivers. Perforce, his journey will be a leisurely one, for he will be in the land of "mañana."

How much will the international Pacific Highway cost? When will it be open to travel and how will the Latin American countries finance its development, are questions that are asked on every hand. The answers are so fundamentally simple that they leave the questions unanswered for the great majority of people.

THE INTERNATIONAL PACIFIC HIGHWAY crosses the "Rim of the Valley of Mexico at an elevation of more than 10,483 feet.

COMPLETE IN SIX YEARS

It is impossible to estimate the ultimate cost of the international Pacific Highway although the initial cost to open up the remaining gaps will be suprisingly low. The road will be improved over a period of years and it is expected that the greater part, if not all, will be passable for automobiles within the next five or six years. The cost of the international Pacific Highway will be paid out of tourist revenue.

It is estimated that tourists from the United States spend from $600,000,000 to $800,000,000 annually in European travel. Within the past few years, an appreciable part of this annual tourist expenditure has been diverted to Mexico and other Latin American countries. These nations, quick to realize the value of this new source of wealth, are today actively and aggressively reaching out for more and more of this class of travel.

HALL OF THE MONOLITHS, ruins of Mitla on Route of the International Pacific Highway.

They recognize the necessity for encouraging this class of business by the usual advertising methods and are doing so in a very practical way.

Tourist bureaus have been and are being established in the principal centers of the United States where information concerning

(Continued on page 29)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY----------Director
JOHN W. HOWE----------Editor

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Vol. 13 FEBRUARY, 1935 No. 2

FROM RUTS TO ROADS

Good roads have become so much a part of every day life that little thought of their contribution to our progress and daily comfort is given to them as we drive along over the smooth stretches of gleaming white concrete, or the equally smooth stretches of shiny black asphalt. Only when the opportunity to ride over less satisfactory highways comes to us, is it impressed upon us what "good roads" really mean.

Not long ago it was my privilege to visit one of those sunny and verdant isles in the Caribbean, among the charms of which even moderately good roads are conspicuous by their absence.

A drive out into the country proved to be one of the most hair-raising experiences it has been my questionable privilege to enjoy. After bouncing and jouncing over ruts, stones and bumps in a cloud of dust from the unmaintained dirt road, we left what was quaintly termed "the good road" and proceeded through a series of mud holes, ruts a foot or two deep, down steep embankments and across streams 4 to 6 feet below the road level, the crossing of which was made possible only by the stamina of an American-made car and the efficiency of a native driver whose wizardry at the wheel was close to a miracle.

Between silent but agonized questionings as to the possibility of getting through such an experience alive, or at least intact, my thoughts could not help reverting to the roads of the United States which heretofore had been accepted as a matter of course—not as a cause for general thanksgiving. *—By O. E. Potter in Contractors and Engineers Monthly.*

Southland Routes Being Marked With New State Signs

RAPID progress is being made by sign-posting crews of the Automobile Club of Southern California on erection of the new-type numbered route signs on main State highways. Seven thoroughfares are now being signed and two more will be posted within the next few weeks.

Consisting of porcelain enamel facing on 18-gauge steel, the new shields have black figures on a white background. This practical method of designating approximately 2000 miles of California highways with some 6000 signs is modeled upon the United States' system of numbering National highways. It was adopted by the State as a means of aiding touring visitors as well as resident motorists and facilitating traffic movement, particularly in metropolitan areas.

At the present time the following routes are being marked in Southern California:

Route 3—Junction of U. S. 101 at Serra Junction of U. S. 101 at El Rio, via Santa Monica.

Route 6—Santa Monica to junction of Route 39 near Fullerton.

Route 10—Junction of Route 3 south of Venice to junction of U. S. 101 at Santa Ana, via Manchester Avenue and Santa Ana Boulevard.

Route 14—Hermosa Beach to junction of Route 18 near Olive, via Artesia Avenue.

Route 15—Long Beach to junction of U. S. 99 near Monterey Park, via Atlantic Boulevard.

Route 19—Junction of Route 3 near Long Beach to junction of U. S. 66 near Lamanda Park.

Route 55—Junction of Route 3 at Newport Beach to junction of Route 18 near Olive.

Southern counties will be posted by the Automobile Club of Southern California, and northern counties by the California State Automobile Association, under existing agreements which provide that the State purchase all materials at its own expense and the automobile clubs pay the costs of labor and transportation of signs and equipment.

MORE RURAL ROADS NEEDED

By encouraging travel for business and pleasure, and the shipment of goods by motor freight, you increase the consumption of gasoline and oil, and you simplify your distribution problems, as well as reduce costs incident thereto. Hundreds of thousands of rural residents want automobiles and trucks, but are delaying the purchase pending the construction of all-weather roads to serve their homes.—*Public Works Magazine.*

Dist. Engineer Gillis Wins Palm for First Road Program Plans

THE DIVISION OF HIGHWAYS program to speed the advertising of construction projects which are financed from the 1935 Federal grant of the Hayden-Cartwright Act has the entire State highway organization keyed to a high pitch in order that all projects shall be under contract by July 1st.

To R. M. Gillis, District Engineer of District VI, with headquarters in Fresno, goes the palm for being the first district engineer to have prepared and submitted to central office complete preliminary reports and plans for his part in this program which is one of the primary factors in the relief of unemployment in California today.

"It is the spirit of determined cooperation which Mr. Gillis and his staff in District VI have exhibited in rapidly advancing the program which justifies the confidence of the Federal government in the sincere desire of the people of California to do all in their power to relieve the unemployment situation," says Assistant State Highway Engineer G. T. McCoy.

"The Division of Highways takes pleasure in acknowledging the splendid efforts of Mr. Gillis and the personnel of District VI under his direction, and in expressing to them the appreciation of the State highway organization for this successful accomplishment."

FEDERAL BOARD RECOMMENDS $117,531,000 MAPPING PROGRAM

In connection with the Federal cooperative topographic mapping program of the State Division of Water Resources, a recent report of the Federal Board of Surveys and Maps to the National Resources Board indicates that satisfactory maps are available for only 26 per cent of the area of continental United States; that the available maps for an additional 24 per cent are not satisfactory or sufficient and that 50 per cent of the area of continental United States is unmapped.

The Board of Surveys and Maps advised that "a base map of the entire area of the United States is a National need" and reports that after an exhaustive investigation it finds much evidence that the actual loss of money due to the lack of adequate maps is greater than the actual cost of completion of the standard map of the United States. It recommends a ten year plan for the completion of this work as a Federal project at an estimated cost of $117,531,000.

First Burglar—I need glasses.

Second Ditto—What makes you think so?

First Burglar—Well, I was twirling the knobs on a safe and a dance orchestra began to play.

HIGHWAYS PAY LARGEST DIVIDENDS ON INVESTMENT

It has been definitely proven that a highway properly located and constructed according to traffic needs, pays better dividends than any other investment. It adds to the wealth of the community.

Good roads have done more to aid living conditions in the country than any other agency. The highway is as essential to agriculture and merchants, who sell farming products and supplies, as the railroad and steamboat are to industry.

Facts show that the number of motor vehicles increased 40 per cent in the past 5 years while the amount of road building increased only 13 per cent.

Seventy-five to ninety per cent of the highway dollar finds its way into wages. This percentage is not greatly changed by the turn of the cycle from prosperity to depression and back again.

—*Wyoming Highways.*

TOURIST CROP SHOWS BIG INCREASE OVER 1933 VISITORS

California's tourist crop for 1934, as represented by the permits issued for non-resident automobiles, showed a gain of 19,138 over 1933. A total of 110,018 nonresident permits were issued for the year for cars coming from every State in the Union and most of the foreign countries.

The total number of nonresident cars entering the State was 154,884 as checked by the border stations of the department. The number of passengers counted was 493,753.

DEADLINE ANNOUNCED FOR ADVERTISING SIGN PERMITS

Outdoor advertising permit plates for 1935 must be in place not later than February 20.

On February 21, the state-wide survey of advertising displays which was temporarily discontinued to allow permittees time to obtain the 1935 plates will be resumed.

In connection with this survey violation citations will be forwarded the owners of all displays which come within the scope of the Outdoor Advertising Act and do not conform to its provisions. Lack of a permit plate constitutes a violation.

Service of these citations will result in the removal of cited displays in accordance with the terms of the act, unless the owners thereof comply with the law.

AUTO SIZE AND WEIGHT STANDARDS GIVEN APPROVAL

A special committee of the Chamber of Commerce of the United States has placed approval upon uniform motor vehicle size and weight standards adopted by the American Association of State Highway Officials.

A statement issued by the chamber hails this approval as "a further step in efforts looking toward solution of highway transport problems."

Six Mile Boulevard, No Grade Crossing

(Continued from page 6)

these streets over the new highway with a minimum of construction costs and property damage. These existing bridges have carried traffic across the Pacific Electric Railway at Macy Street, Lord Street, State Street, Cornwell Street, Marengo Street and Soto Street inside the city limits of Los Angeles.

Construction of the improvement from Mission Road and Aliso Street in Los Angeles to the intersection of Garvey Avenue and Atlantic Boulevard in Monterey Park, has been done under ten separate contracts. Three of these contracts were for grading and paving the various sections of highway and the other seven contracts were for bridge construction to provide eight grade separations at intersecting streets and roads.

Of these seven bridge contracts, five were for extending or reconstructing existing bridges which already crossed the Pacific Electric Railway at Lord Street, State Street, Cornwell Street, Marengo Street and Soto Street. Another contract was for the reconstruction and extension of the reinforced concrete bridge at Eastern Avenue to carry Ramona Boulevard under said structure.

UNIQUE GRADE SEPARATION

The remaining bridge contract on this section was for the two grade separations to carry Monterey Pass and Coyote Pass roads under the new highway. The highway crosses the Monterey Pass Road on an overhead bridge but a rather unique grade separation is effected on the Coyote Pass Road. This is a partial grade separation by which traffic going southwesterly along Coyote Pass Road will be diverted to the right and passed under the highway instead of making a left-hand turn across traffic.

From the intersection of Mission Road and Aliso Street, the first two highway contracts extend for 1.59 miles along the Pacific Electric tracks to Fickett Street. This portion will be 64 feet wide between curbs with a concrete pavement 40 feet wide and 12-foot oiled shoulders. From Fickett Street to Evergreen Avenue the city of Los Angeles recently completed a pavement 48 feet wide, which is being utilized as a portion of this route.

From Evergreen Avenue to Atlantic Boulevard, a distance of 3.8 miles, the highway partly follows along new right-of-way and previously existing portions of Ramona Boulevard, Harrison Street and Cotton Avenue and finally cuts across the Midwick Country Club grounds in almost a direct line to connect with the westerly end of Garvey Avenue, a short distance west of Atlantic Boulevard.

DRIVING TIME HALVED

The section from Evergreen Avenue to Atlantic Boulevard has been constructed in one contract and consists of a 40-foot pavement with 20-foot oiled shoulders. This makes a total of 5.39 miles recently constructed by the State and one-half mile by the city, between the westerly end of Garvey Avenue at Monterey Park, and the business district of Los Angeles.

It is difficult to estimate the value of the Ramona Boulevard improvement to both local and through traffic. From Monterey Park to Los Angeles the driving time will be nearly cut in half by avoiding the present congested route via Brooklyn Avenue, by shortening the distance .6 mile, which the new route will do, and by eliminating grade crossings of intersecting streets. By far the greatest benefit, however, will be the increased safety to traffic due to eliminating grade crossings and congested business streets.

Construction work on the Ramona Boulevard route was started in January, 1934, and was scheduled to be completed by the first of this year. However, unusually heavy fall and winter rains have delayed work to a considerable extent so that it will probably not be completed until about the first of March.

ROUTE ADOPTED IN 1931

The Garvey-Holt Avenue route from Pomona to Los Angeles of which the Ramona Boulevard project is the final link was adopted as a State highway route in 1931 and was to extend from the westerly end of Holt Avenue in Pomona in almost a direct line into Los Angeles, utilizing existing pavements on Arroyo Avenue in West Covina and Garvey Avenue through Monterey Park. It was contemplated at that time that additional sections would be constructed on new locations wherever necessary to maintain direct alignment.

(Continued on page 24)

Doctor's Tar Surface Experiments Brought First Road Congress

IT WAS no civil engineer but a doctor who first began experimenting with a tarred surface for eliminating dust from roads. The doctor in question, Ernest Guglielminetti by name, told the story of his discovery to the delegates of the Seventh International Road Congress recently held in Munich, Germany.

Dr. Guglielminetti, who is German Swiss by nationality, is no road expert yet his work as the originator of the tarred roadway has earned him the sobriquet of "Dr. Tar" in civil engineering circles. Dr. Guglielminetti told his hearers that while in Monte Carlo as physician in ordinary to the Prince of Monaco he noticed the extent to which motor drivers suffered from road dust. Knowing from his experience as a military doctor in the tropics that it was the custom to saturate the floor with tar to prevent dust developing he begged from the Prince of Monaco the use of a few yards of roadway to experiment with putting a tarred surface on it.

FIRST ROAD CONGRESS RESULTED

"As soon as my first roads on the Riviera were ready," said Dr. Guglielminetti, "I got countless letters, particularly from German engineers who wanted to see these roads. I arranged the first "road meeting" with them and a German building councilor made the suggestion that a road building congress should be held.

France was enthusiastic for the idea. Germany's support was promised me in 1905 by the Kaiser, who received me at the Gordon Bennett races in the Taunus. And I succeeded also in awakening England's interest. Thus it was that the first international road construction congress came about 25 years ago."

Before the departure of the Congress delegates from Munich to view the new German national roadways under construction a farewell reception was held in their honor in the magnificent halls of the royal castle at Munich by Herr Siebert, Prime Minister of Bavaria.

Boss—"When you called up my wife and told her I would be detained at the office, and would not be home until very late, what did she say?"

Steno—"She said: 'Can I depend on that?'"—*Vancouver Province.*

THE BAY BRIDGE

How many minds and hands are joined to rear
This towered path across the tide-swept bay!
Men pitied Norton,* but the engineer
Has made his dreams reality. Today
Gaunt towers pierce the foggy shroud of night
And flood-lights gleam on blocks of man-made stone
That bind to rock, against the water's might,
An highway, such as gods did never own!
Do they, secure in their place on high,
Cold and undreaming, prideful of their sway,
Feel, as they tread their yet unspoiled domain,
This track we fling across their virgin sky
Is sacrilege? Surely, they too must pray
That this, a madman's dream, we shall attain!

BY PETER W. MOURER, JR.
Junior Construction Engineer
of San Francisco-Oakland Bay Bridge.

* *The late "Emperor" Norton of San Francisco.*

HUGE WHEELS SHUTTLING ACROSS BAY WILL SPIN WIRE CABLES

(Continued from page 12)

in 1935 lined with concrete to form the outer concrete wall of the completed tunnel. The core of rock left within the horseshoe will be excavated by blasting and steam shovel, and will probably be the first time a steam shovel has been used in excavating a tunnel. This is made necessary by the size of this tunnel—58 feet by 76 feet—probably the largest bore tunnel ever undertaken, Chief Engineer Purcell points out.

While these bay operations are in progress contracts will be awarded for the Alameda County and San Francisco approach work, and bridge approach construction within both counties will be more than half completed.

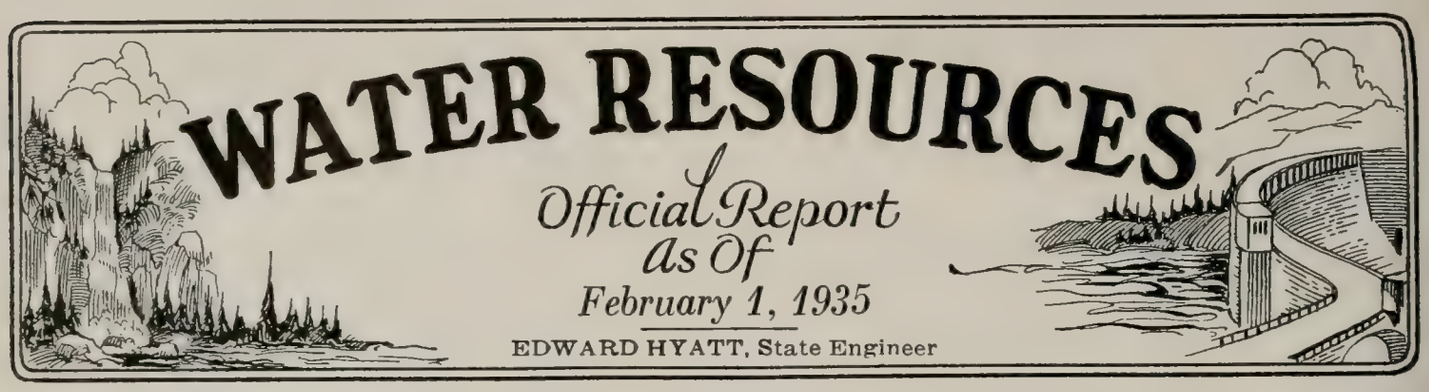
AUTO REGISTRATIONS ON INCREASE

Here's some evidence of better times ahead.

United States registrations of motor vehicles in 1934 increased over the preceding year for the first time since 1930. A preliminary survey records 24,952,007 cars, trucks and buses registered during the year, compared with 23,849,932 in 1933, a gain of 4.5 per cent.

Another indicator is the great increase in interest regarding touring to California on the part of motorists in other sections of the country as evidenced by thousands of requests for detailed data on transcontinental highway conditions and sectional road maps.

That dust pall in the distance is merely Old Man Depression making tracks for where-at-he-came-from.



Increased stream flow in the Sacramento Flood Control area following heavy rains of January made it necessary to operate the Sutter By-pass drainage pumping plants and materially reduced salinity in the Delta region. SERA relief labor engaged in clearing flood channels during the month totalled 38,552 man-hours.

Applications for the construction, repair and approval of dams and appropriation of water, news of flood control and other activities of the division are given in the monthly report as follows:

IRRIGATION DISTRICTS

Bonds in the amount of $165,000 were voted on January 5th by the South Fork, Modoc County, Irrigation District. The bonds are to be used as security for funds from PWA wherewith to construct the storage works proposed by the district.

The RFC has made available $1,162,500 to the Oakdale Irrigation District with which to complete the refinancing plans of the district.

DISTRICTS SECURITIES COMMISSION

At the January, 1935, meeting the commission gave approval to requests from irrigation districts in the following matters:

Newport Heights Irrigation District—Calling of an election for refunding bonds to be issued to RFC.

El Dorado Irrigation District—Filing of action under the Federal Bankruptcy Act.

Citrus Heights, West Side and San Dieguito Irrigation Districts—Expenditures from general fund.

Banta-Carbona, Merced, Oakdale, Santa Fe, Fair Oaks, Citrus Heights, San Dieguito, Alpaugh, Big Springs, Carmichael, Corcoran, Jacinto, Lindsay-Strathmore, Thermalito, Oroville-Wyandotte, Naglee-Burk, Tracy-Clover, Waterford, West Side and Montague Irrigation Districts—Modification of assessments for 1934–1935 under section 11 of the Securities Commission Act.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Following the heavy rains which occurred early in January, it was necessary to operate all three of the Sutter By-pass drainage pumping plants. Included in the routine maintenance for this period was putting all weirs and bridges in shape for the winter.

SERA Relief Work.

The SERA relief projects sponsored by the State Reclamation Board under the direction of this division, continued the work of clearing the flood channels. During the period a total of 38,552 man-hours was expended. Owing to weather conditions, it was not possible to do much work in the Tisdale and Sutter By-passes. On December 31st the Sacramento By-pass clearing was closed down, all the man-hours allotted for this work having been used up. The total man-hours of relief labor worked to date are as follows:

	Man-hours
Federal Transient Service, Upper Sutter By-pass	6,278
Federal Transient Service, Tisdale By-pass	2,989
Federal Transient Service, Lower Sutter By-pass	15,490
SERA Project No. 35-B14-27, American River	49,408
SERA Project No. 58-B14-15, Feather River above Marysville	36,968
SERA Project No. 58-B13-35, Feather River south of Marysville	18,609
SERA Project No. 57-B14-4, Sacramento By-pass	9,472
Total	139,214

Flood Measurements and Gages.

Following the recent storms water spilled over all the weirs of the flood control project with the exception of the Sacramento weir. The water was approximately two feet above the crests of the Tisdale and Colusa weirs and about one foot above the Moulton weir, while at Fremont the maximum head was 0.3 foot at the west end with no water flowing over the east end. The discharges of the Moulton, Colusa and Tisdale weirs were measured by the United States engineers.

The radio gage at Coloma is now operating satisfactorily. One discharge measurement was made at this station. Several discharge measurements were made of the West Intercepting and Wadsworth canals.

DAMS

Certificates of approval for nine dams, including the Morris Dam of the city of Pasadena and the Bouquet Canyon Dam of the city of Los Angeles, have been issued.

City Granted $1,250,000 Water Power

(Continued from preceding page)

Construction is nearing completion on the Vasona Dam of the Santa Clara Valley Conservation District. Contract has been awarded for the Almaden, Calero and Stevens Creek dams and work is expected to start as soon as the weather clears. Final plans of the proposed Coyote Dam have been received. The exploratory work has been completed and the plans and site are being investigated by this office.

Work on placing the timber facing and additional fill on San Gabriel No. 2 Dam of Los Angeles County Flood Control District is under way. At San Gabriel No. 1 Dam the only progress made during the month has been in the excavation of the cut-off trench.

Inclement weather has slowed down progress on the repairs of the Los Verjels and Antioch dams, as well as the enlargement work at the Williamson and Orinda dams. Work still under way at the El Capitan Dam of the city of San Diego consists of placing the inner lining in the outlet tunnel.

It is expected that the recent rains will fill many of the reservoirs which have not been filled for the past two or three years and give an opportunity for inspection of the dams under conditions of maximum storage.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Maintenance of the Delta tide gages has continued as well as salinity sampling at sixteen permanent stations in the Upper Bays and in the Delta.

Due to the storms of the past month the flow of the Sacramento River at Sacramento increased to 50,000 second-feet on January 10th and has continued at about this figure to date. As shown by the following table, the salinity on January 10th had dropped to 15 parts of chlorine, or lower, per 100,000 at all Delta stations, with a corresponding material reduction at Upper Bay stations.

Salinity at Upper Bay and Delta Stations on January 10, 1935

Station	*Salinity in parts of chlorine per 100,000*
Bullshead	180
Bay Point	30
O and A Ferry	20
Collinsville	2
Emmaton	3
Antioch	9
Jersey	9
Central Landing	4
Dutch Slough	15
Rindge Pump	4
Middle River P. O.	9

WATER RIGHTS

Supervision of Appropriation of Water.

During December, 17 applications were received; 12 were denied and 13 were approved. In the same period 10 permits were revoked and 2 passed to license.

Among the applications received was one by the city of Ventura seeking to appropriate 9800 acre-feet for municipal purposes from Coyote Creek, a tributary of Ventura River, at an estimated cost of $532,000.

Among the applications approved were two by the city of Eureka, one of which sought to appropriate 400 second-feet and 90,000 acre-feet from Mad River for power purposes at an estimated cost of $1,200,000, and the other sought to appropriate 7.74 cubic feet per second and 750 acre-feet per annum from Mad River for municipal purposes at an estimated cost of $375,000.

In October the Division requested reports from 1355 permittees and 433 licensees and on January 1st reports had been received from 1045 permitees and 356 licensees.

Federal Cooperation—Topographic Mapping.

Office work, proceeded in connection with the Eureka, Bogus and Bartle Quadrangles in Humboldt, Siskiyou and Shasta counties.

The Board of Surveys and Maps advised that "a base map of the entire area of the United States is a National need" and reports that after an exhaustive investigation it finds much evidence that the actual loss of money due to the lack of adequate maps is greater than the actual cost of completion of the standard map of the United States. It recommends a ten year plan for the completion of this work as a Federal project at an estimated cost of $117,531,000.

WATER RESOURCES

The report on the Mojave River Investigation has been completed and will be available for distribution early in February.

Work on the South Coastal Basin Investigation has continued along routine lines during the present month. Bulletin 45, covering geology and ground water storage capacity of valley fill, South Coastal Basin, is in the print shop and will be ready for release during the early part of February.

The Legislature, upon recommendation of Governor Merriam and the Director of Public Works authorized an appropriation of $50,000 for immediate use to prosecute efforts to secure early Federal aid and assistance in financing the construction of the Central Valley Project as said project is authorized and defined in the Central Valley Project Act of 1933.

ONE-THIRD MILE MODEL ROAD TO BE BRITISH FAIR EXHIBIT

A model road, built expressly for the purpose of demonstrating the latest developments in roadmaking, will be one of the special exhibits to be featured at the Engineering Section of the British Industries Fair to be held in Birmingham, next spring. Thirty feet wide and one-third of a mile long, it will be divided into seven sections, in each of which one of the following surfacing materials will be used: macadam, concrete, rubber, wood, brick, stone, and iron.

$876,000 Annual Saving to Motorists

(Continued from page 20)

Construction was commenced in 1932. A 6.06-mile contract was awarded from Pomona westerly on new alignment through the San Jose hills and Kellogg Ranch, to Barranca Street at West Covina. From Barranca Street to the easterly end of Garvey Avenue three other contracts for grading and paving sections of highway have been completed. One of these extends from Barranca Street along Arroyo Drive for 3.78 miles to Orange Avenue and consisted of widening and resurfacing an existing pavement.

From Orange Avenue a 4.31-mile contract was completed in June, 1933, for construction on an entirely new alignment extending across numerous walnut and orange groves, the San Gabriel River and the Southern Pacific Railroad near El Monte. This section connects with the east end of Garvey Avenue at Mountain View Road, a short distance east of El Monte.

NEW BRIDGE BUILT

Since this latter section crosses San Gabriel River on a new location, it was necessary to construct a new bridge and approaches. A reinforced concrete girder and deck type bridge 964 feet in length with 44-foot roadway and two 3-foot sidewalks was constructed under separate contract. Another very important structure on this route is the subway under the main line east of the Southern Pacific Railway near El Monte which was handled under separate contract.

From the intersection of Mountain View Road and Garvey Avenue, the existing pavement on Garvey Avenue has been used through Monterey Park to the beginning of the Ramona Boulevard project at Atlantic Boulevard and Garvey Avenue. Although this old pavement is usable it is quite narrow in places and in other places is in rather poor condition.

A contract has just been let for improvement of Garvey Avenue through the city of Monterey Park. This is to consist of widening the right-of-way to 100 feet and constructing curbs 76 feet apart throughout this entire length wherever they do not already exist in the proper locations, paving the full width between curbs for the five blocks of the central business section of Monterey Park and constructing wide oil and rock shoulders on the balance of Garvey Avenue through Monterey Park. An old timber bridge across Alhambra Wash on Garvey Avenue was washed away by the flood waters of January 1, 1934, and is now being replaced by a larger permanent structure.

For the Ramona Boulevard project proper (from Atlantic Boulevard to Mission Road and Aliso Street) construction costs amount to $877,000. The wisdom of this improvement can be seen from an analysis of traffic studies which have been carried on at various places along the new route. It is conservatively estimated that the daily volume of traffic on this route near El Monte will be 20,000 cars per day with a very much greater volume largely composed of local traffic on the Ramona Boulevard portion.

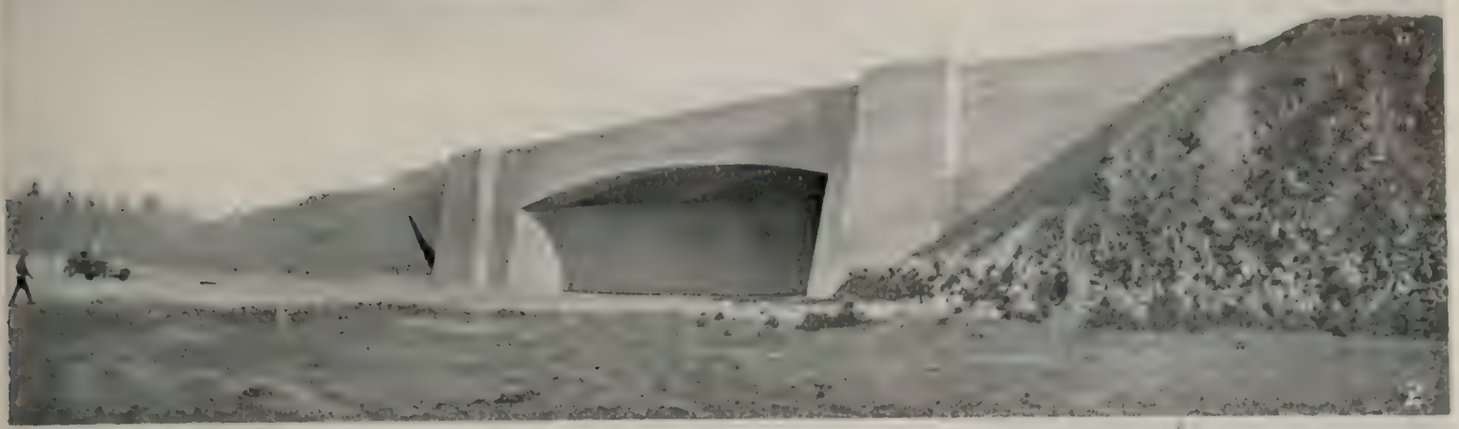
The new route from Pomona to Los Angeles is slightly less than 27 miles in length as compared to slightly more than 30 miles on Valley Boulevard, the shortest alternate route. Assuming an operating cost of 4 cents per mile for all cars including trucks and busses, the saving of three miles in distance will amount to an annual saving of $876,000, which is sufficient to pay the entire construction cost in less than two and one-half years.

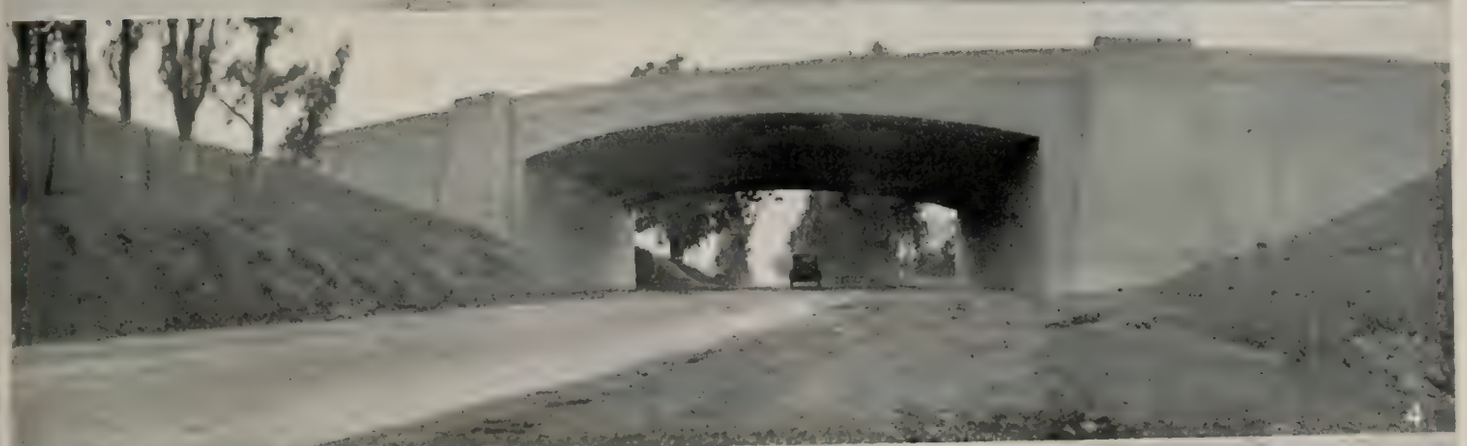
This saving in operating cost, due to shortening the distance, is not so important as increased safety and saving in time. A conservative estimate of the average saving in time per car on the new route from Pomona to Los Angeles is 20 minutes, or an annual saving of 2,400,000 car-hours. As the average car will probably contain more than two people, the annual saving in time would amount to the time of one person for about 5,000,000 hours.

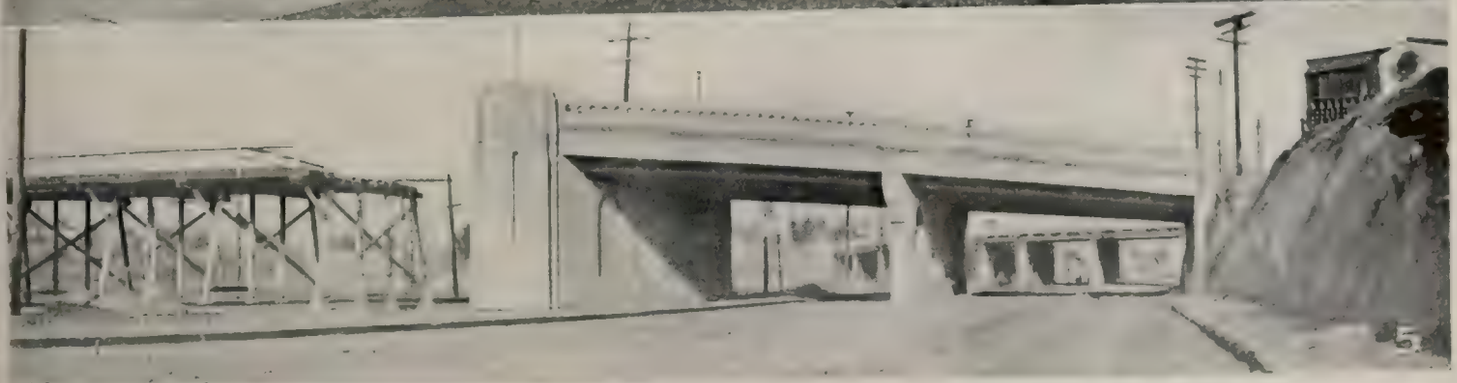
But probably the feature of greatest importance and value in the entire route is the Ramona Boulevard portion which will permit the uninterrupted flow of traffic for six miles through the suburban district from Monterey Park into the Civic Center of Los Angeles.

Employer (to newly hired typist): "Now I hope you thoroughly understand the importance of punctuation?"

Stenographer: "Oh yes indeed. I always get to work on time."







GRADE CROSSINGS ARE ELIMINATED on the new Ramona Boulevard by seven bridges, five of which are shown above. No. 1—Eastern Avenue, a reinforced, concrete girder structure which the State extended with a 39-foot, 6-inch span providing a 60-foot roadway and 2-foot 8-inch sidewalks. No. 2—Coyote Pass grade separation, a 140-foot concrete girder structure providing a 60-foot roadway and 2-foot, 4-inch sidewalks. No. 3—State Street, a concrete girder structure extended by the State with two 44-foot spans providing a 40-foot roadway and two, 2-foot, 5-inch sidewalks. 4—Monterey Pass, an 87-foot concrete girder span providing a 60-foot roadway and two 4-foot sidewalks. This structure permits Monterey Pass traffic to pass under Ramona Boulevard. No. 5—Marengo Street, a 112-foot reinforced concrete girder extension of the existing bridge. Provision is made in the next biennial budget for extending the concrete construction to replace the old section of bridge.

New Type Timber Arch Bridge Spans Dolan Creek Gorge on Coast Highway

By **STEWART MITCHELL,** Assistant Bridge Engineer

THE Carmel-San Simeon highway in Monterey County, which is now approaching the final stages of construction, has provided numerous and varied problems for the bridge engineer. The gorges which must be spanned are often deep, foundation conditions are uncertain and difficult, and availability of materials and hauling conditions are important factors.

At the northerly end of the road the bridges are of concrete, notably the huge Bixby Creek arch and the smaller but no less attractive arches over the Rocky and Garrapata Creek ravines. Here the proximity to Monterey and other sources of concrete aggregates and the general conditions favored this type of construction. Farther to the south the uncertainty of finding suitable concrete aggregates for large structures, construction difficulties and economic causes favored the use of timber, and a large number of redwood timber trestle and truss structures have been built.

TIMBER SPAN ADVISABLE

At Dolan Creek, owing to the depth of the ravine and the foundation conditions, a long central span was advisable and there arose the question of a suitable and economic type of timber span which could be used.

On the Redwood Highway in Mendocino County there is a framed timber arch over Rock Creek which has given excellent service for some fifteen years and apparently has many features to recommend it. Also, about the time that the construction of Dolan Creek was being considered, information on special types of timber connectors previously used in Europe was compiled and published by the National Committee on Wood Utilization of the Department of Commerce assisted by the Forest Produce Laboratory of the Department of Agriculture, the latter having made numerous tests to determine the best type of connectors adaptable to American Woods and construction methods.

The purpose of these connectors is to increase the efficiency and the service rendered by wood as a construction material which they do largely through the improvement in the strength and dependability of the timber joint, long recognized as the weakest part of any timber structure. In brief, the connectors consist of metal rings or other shapes which, embedded partly in each member, transmit the load from one wood member to another.

RING CONNECTORS USED

In this structure rings are used most often and are of two types. One type has teeth which are forced into the face of the wood members to be joined. The second type is a plain ring similar to the well known gas engine piston ring and is fitted into precut grooves. Each kind has its advantages in different parts of the structure, but in general the solid rings are used to connect the members of the main trusses which carry the highway. A bolt is run through the center of the connectors to keep the members from spreading apart.

The Dolan Creek Bridge consists of a main central span 180 feet long which is constructed as a framed timber arch and spans a gorge the bottom of which is approximately 150 feet below the surface of the highway. On each side of the main span there are two 38 foot girder spans, the girders being built up of timbers fastened together with these connectors. In addition, there are thirteen ordinary trestle spans each 19 feet long at the north end of the bridge.

It was decided to adopt the type of construction in which the connectors are used for this bridge, one reason being that it permitted the use of smaller-sized timbers in a situation where the handling and hauling of large pieces is a matter of some concern.

PIONEERING CONSTRUCTION

Since the Division of Highways was pioneering in this type of construction it was to be expected that contractors would be somewhat uncertain as to the cost of construction and would allow a certain amount to take care of their lack of experience. It developed that such was the case, although the prices bid were such that the total cost of the structure was not excessive as compared with other types that might have been used in this locality.

DOLAN CREEK TIMBER ARCH—This 180-foot span on Carmel-San Simeon highway involved some pioneering construction for a timber span of such length. Metal ring connectors were used to increase the strength of the timber joints.

The timber for the arches and other built-up members was framed, the grooves cut, etc., in a yard near the dock in Monterey. The arch was completely fitted together while lying on the ground, and then dismantled and hauled to the job.

In order to cut the necessary grooves special tools were designed by the contractor with the assistance of the representatives of the timber interests, and these accomplished the work without difficulty, the framing being carried through without a hitch. It was necessary, under the terms of the contract, to use hand labor as much as possible, which meant that all the boring of bolt holes and smaller grooves had to be done by hand, but the contractor was permitted to use power for cutting the larger grooves as it was found that a satisfactory job could not be obtained otherwise. The contractor chose to erect light falsework upon which to build the arch ribs.

PLACED BY HIGHLINE

The members of the rib were individually carried out into place by a highline, although consideration had been given in the design of the bridge to building up panels on the ground and carrying them out to place. The contractor's equipment was not rigged up so that this procedure could be carried out but it is the opinion of both the contractor and the engineers of the Bridge Department that it would be the most economical method of construction and that future design should be prepared with this idea in mind.

In addition to this, numerous other features of future designs would be changed to conform to the experience gained from the building of this bridge, and it is believed, that where the conditions are favorable, an economical bridge of pleasing appearance will result. H. L. McCready was resident engineer on the bridge construction, assisted by T. K. May, who detailed and drew the plans for the structure.

She (just kissed)—I didn't think you were that kind.

He—I'm even kinder than that.

Mr. Binks was busily engaged with a spade in the mud beside his car when a stranger hailed him.

"Stuck in the mud?" he asked.

"Oh, no!" replied Mr. Binks cheerily. "My engine died here and I'm digging a grave for it."—*Life.*

14 Snow Plows Keep Donner Open

(Continued from page 2)

U. S. Route 40, from Colfax over Donner Summit to the Nevada State line, was the most difficult route in the State to keep open, largely on account of drifting snow. On this section, ten 4-wheel-drive trucks with push-plow attachment, three auger-blower and one railroad type rotary plow were operated.

With this equipment working constantly, the road was kept open, although for five days, on account of restricted width, it was necessary to close the road to trucks and to convoy light traffic over the summit under patrol car control. During this period, it was necessary to allow less important roads in the vicinity to close. These were opened again as soon as equipment could be released from the main route.

SNOW FENCE EFFECTIVE

Almost as difficult as the Donner route was that portion of the "East of the Sierra Highway," Route 23, in District IX. On 140 miles, from the Nevada State line to Bishop, three summits are crossed, ranging up to 8100 feet in elevation. The snow at this altitude is dry and light, and when driven by strong gales necessitates the continuance of snow removal operations long after the actual fall of snow has ceased. Seven truck push-plows and two auger-blower type rotary plows were used to keep this road open to traffic.

In comparison with a season's fall of 138 inches for last year and 96 inches for the year previous, the fall to date at Deadman's Summit has amounted to 164 inches. During the worst of the storm, snow fell at the rate of from 2 to 54 inches a day; the maximum rate of fall being as high as a foot an hour.

Long stretches of snow fence have been installed at points where drifting was extremely serious. To date some nine miles of fence, ranging from four feet to twelve feet in height, protects the highway. Comprehensive surveys indicate that 31 miles of additional fence will be required to adequately control the relentless action of the wind. Past storms in this region indicated the natural slope of snow behind fences to be about 7 to 1. The high winds of this season have caused drift slopes as great as 14 to 1.

At times when blizzards are raging over certain sections of the route, passage by inexperienced motorists would be extremely hazardous if not impossible. To forestall the possibility of parties becoming snowbound in the area, the flow of traffic is controlled by gates. During the winter season, control stations are established at Crosby's, 16 miles north of Bishop, and at Leevining. Only those engaged in snow removal operations or those familiar with the country are allowed in this area during storm periods. During the recent big storm, conditions dictated the closing of the road to general traffic for a period of five days.

Snow of high moisture content tested the ability of road forces in charge of the highways radiating easterly into the Sierras from Fresno and the Mother Lode country. Two rotary type and nine push plows were used in keeping these roads open. The maximum snowfall occurred on the Calaveras Big Trees route and amounted to 60 inches.

A heavy fall of snow in the Sierra Madre Mountains back of Los Angeles made necessary the use of all available equipment in order to clear the mountain highways for the throngs of snow sport enthusiasts. During the week end of January 19–20, 5000 cars, representing some 20,000 people, wound their way over snow-cleared highways to Los Angeles County's recreational area at Big Pine Park.

Similar conditions prevailed in the San Bernardino Mountains where throngs of valley residents surged to the famous Lake Arrowhead and Big Bear resorts for a day in the snow. Long hours of toil on the part of the highway crews were necessary to insure their safe and carefree journey.

Even in San Diego County at the south end of the State, winter brought its mantle of white to the higher mountain areas. Snow equipment, inactive last year, was assembled and roads cleared without difficulty.

The great influx of motorists into the snow areas again justified the program of snow removal on mountain highways. On the Sunday following the storm, 430 machines traveled over Donner Summit, 487 used Route 15 east of Nevada City, and almost 2000 machines used State highways into the Cuyamaca State Park near San Diego to enjoy the snow sports. None of these highways could have been used were it not for the department's policy of snow removal.

California Can be Trade Center for all South America

(Continued from page 17)

tourist attractions south of the Rio Grande is being disseminated. Railroad and steamship lines are also active in promoting travel to Latin America. This immediate influx of tourist wealth will create the desire and ability to make passable the international Pacific Highway as well as other highways leading to the United States.

The effect of automobile tourist travel upon the economic condition of Latin America is not a matter of speculation. The experience of the United States during the past twenty-five years fully justifies the statement that an era of material development will dawn in Latin America with the influx of automobile tourist travel which will have no parallel in western history.

VAST TRADE POSSIBILITIES

The effect of this development upon the United States of America is beyond human calculation, other than to say, that the greater part of every tourist dollar expended in Latin America will ultimately find its way to the United States through the channels of trade. In this new era Western United States and California, in particular, will benefit immeasurably. With its Spanish heritage and traditions, California can easily become the trade center for all Latin America.

Our merchants and their representatives, and the various chambers of commerce, have not yet sensed the commercial aspect. California holds a natural attraction to our Latin neighbors for several potent reasons. Inured to a warm climate and abhorring the cold, sleet and the snow of the Atlantic seaboard, our climate approximates theirs.

Our historical background, like theirs, is of Spanish origin. We have largely preserved the Spanish nomenclature, and last but not least, we have the largest Spanish population of any State in the United States.

Should we not capitalize these natural advantages, using the International Pacific Highway to cement our friendship, and establish a commercial relationship at the same time? The opportunity exists for Los Angeles and San Francisco to first extend an invitation, and then provide certain facilities now lacking.

PREDICTS WINTER SPORTS DEMAND FOR MORE ROADS

Ski enthusiasts are doubling each year, according to Bestor Robinson, attorney, mountain climber and prominent Sierra Club winter sports devotee.

Speaking before the Rotary Club in Berkeley, Mr. Robinson prophesied that winter sport interest will lead to increased demand for roads in the Sierra timberline areas. The only such region at present easily reached by the motoring public is situated along the Donner Pass road. The popularity of this region is well known. Mr. Robinson comments that in Europe desirable skiing areas are reached in most places by funicular railways. He believes that in California public interest and a motor-minded public will demand that other high mountain roads, as well as the Donner route, be kept open throughout the year. He mentioned possible new roads to reach some of the world's best skiing areas located along the Sierra crest. Mr. Robinson stated that most of this area is at present inaccessible to winter sports enthusiasts.

Other markets of our Union seized and have held a predominance in the handling of certain commodities because these cities embraced the opportunity when it was presented to them, by supplying the facilities required for the particular commodity. For illustration, we have but to mention New Orleans, the cotton market of the world, St. Louis, the fur trade market.

PROVIDE FACILITIES

When St. Louis was an outpost it naturally became the depot for furs. It catered to that trade, provided the facilities, and holds her supremacy to this day. Chicago, because of her strategic geographical situation and with her network of railroads radiating to the grain-growing States, became the grain center of the United States. Chicago provided the facilities, elevators, tracks, etc., otherwise some other enterprising city would have monopolized that staple. New York early provided shipping facilities, and became the greatest port in North America. Detroit catered to the automobile industry, etc.

California can just as surely become the clearing house for the South American trade by furnishing the facilities which will attract the trade and permit it to function comfortably and economically. A suggestion of the facilities which would add much to trade development would be the erection of buildings, or utilization of existing buildings, for display of South American products.

New Type Highway Lights Installed as Experiment at McConnell Subway

IN AN ENDEAVOR to obtain information that will increase safety in vehicular operation at night on State highways at points of possible hazard, the Division of Highways is making a trial installation of a new type of light at McConnell substation, where State Highway Route 4 passes under the Southern Pacific Railroad between Sacramento and Stockton.

The light is of the sodium vapor type, brought out by the manufacturer in an effort to produce units for highway lighting which would be satisfactory from the drivers' standpoint and sufficiently economical as to installation and operating costs as to make highway lighting more general than at present.

GLARE ELIMINATED

Until very recently, at least, the most satisfactory light was that of the incandescent type. In addition to the cost necessary to obtain satisfactory results on the large areas involved, this type of lamp has a light source of very high intensity, offering some difficulty in providing the desired degree of illumination without an accompanying glare which tends to defeat the purpose of the illumination.

A light of the wrong type or improperly installed may be more dangerous on a highway than no lights other than the headlights of vehicles, particularly if glare is present, as it may conceal a vehicle or obstruction behind it from sight of the approaching driver.

SODIUM VAPOR TUBE

The type of light installed is reported by the manufacturer to have marked advantages in these regards. The light is developed by the passage of an electric current through sodium vapor in a tube 3 inches in diameter and 12 inches long. This entire tube glows and gives off its light in a manner similar to the neon tube used for advertising purposes and is of a soft orange color.

The light has the distinction, as compared to daylight or incandescent lamp light, of being monochromatic; that is, of having only one color instead of a fusion of many. This characteristic causes a loss of color differentiation of objects under the light, but it is claimed that this is not necessary for the particular purpose for which developed. The outstanding feature claimed for the lamp is an absence of glare due to the large volume low intensity light source as compared to an incandescent lamp giving off the same amount of light.

TWO LAMPS USED

This type of light was first offered by the manufacturer in the spring of 1934 and the installation referred to is one of two first made in the west. It will be watched with interest to see if it is development worthy of further use.

The installation consists of two 1000-candle power units, mounted on 23-foot ornamental steel standards.

1934 Gas Tax Return Shows Slight Gain

Gasoline tax assessments for the calendar year 1934 amounted to $39,625,055.32 as compared with $39,307,352.99 for 1933, an increase of $317,702.33, or .81 of one per cent.

That the figures for 1934 show an increase over those for 1933 is due largely to the fact that the returns for March, 1934, were for some unaccountable reason abnormally high, being $794,594.33 in excess of those for March, 1933, and also to the fact that the December, 1934, assessments, contrary to expectations, exceeded those of December, 1933, by $456,494.06.

Until the December returns were available it appeared that the 1934 revenue would fall slightly below that of 1933, but instead, 1934 is the first year to show an increase since 1931, in which year assessments reached their highest total for a single year, $41,625,893.24, almost an exact $2,000,000 greater than the figure for 1934.

"Lady's purse left in my car while parked. Owner can have same by paying for this ad. If she will explain to my wife how the purse got there I will pay for the ad myself. Phone M-123 League City."

A HIGHWAY LIGHTING EXPERIMENT being tried out at McConnell subway on Sacramento-Stockton route consists of two 1000-candle power sodium vapor lamps mounted on 23-foot steel standards.

Report on Loss of Mojave River Water

The release is announced by State Engineer Edward Hyatt of Bulletin 47 entitled "Mojave River Investigation" issued by the Division of Water Resources. This report goes into the hydrology of the Basin but does not attempt to lay out a specific project.

It is concluded that the average annual water supply is 97,000 acre feet but most of this is lost by evaporation or transpiration and only about 15 or 20 per cent of the water is used beneficially. Occasionally large floods force themselves through the basin and into the dry lakes beyond.

Settlement along the river is small in amount. The problem is not one of deficient water supply as wells can be sunk in the area influenced by Mojave River and in a considerable part water can be readily secured at small depths. If development had taken place the water table would be lower and a much larger amount of water from the river would percolate to the water table than now does.

The native vegetation which now uses so much of the stream with little economic benefit would in large part be killed by lowered water table.

Higgins Elected Head of State Employees

At the close of the annual General Council meeting of the California State Employees Association held in Los Angeles February 9th and 10th, E. Roy Higgins, comptroller of the Department of Public Works, Sacramento, was elected president.

Mr. Higgins is a graduate of the University of California, class of 1919, and has been in the State service since 1922, for the last seven years as comptroller of the Department of Public Works. He has been active in the affairs of the Employees Association since its inception, and for three years has been chairman of the Publicity Committee and Editor of the California State Employee, official magazine of the Association.

A. I. Rivett, Assistant District Maintenance Engineer of the Division of Highways at Stockton was elected chairman of the Publicity Committee.

Man: How far have you and your wife got with your plan to buy a new car?

Neighbor: We got to the point where we don't speak.

Highway Bids and Awards for the Month of January

AMADOR COUNTY—Between Martell and Jackson, about 1.5 miles to be graded and surfaced with bituminous treated crushed gravel or stone (road mixed). District X, Route 34, Section B & Jkn. T. M. Morgan Paving Co., Los Angeles, $46,508; Fredrickson & Watson Const. Co., Fredrickson Bros., Oakland, $48,191; Hemstreet & Bell, Marysville, $66,851; C. W. Calotti & Co., San Rafael, $51,747; Tiffany Const. Co., San Jose, $47,669; A. Teichert & Son, Inc., Sacramento, $49,162. Contract awarded to J. R. Reeves, Sacramento, $46,450.80.

LOS ANGELES COUNTY—In Monterey Park, between Atlantic Boulevard and New Avenue, 1.5 miles, grade and asphalt concrete pavement. District VII, Route 26, Section Mon. P. Geo. R. Curtis Pave. Co., Los Angeles, $35,493.20; J. L. McClain, Los Angeles, $36,132; C. O. Sparks, Los Angeles, $37,691; Oswald Bros., Los Angeles, $38,482; L. A. Paving Co., Los Angeles, $40,813; So. Calif. Roads Co., Los Angeles, $43,765; P. J. Akmadzich, Los Angeles, $44,127. Contract awarded to Griffith Company, Los Angeles, $35,-454.50.

LOS ANGELES COUNTY—Between California Ave. and Colorado Ave. in Santa Monica, 0.8 of a mile to be paved with Portland cement concrete. District VII, Route 60. Alternates "A" and "B". Mundo Engineering Co., Los Angeles, "A" $74,076; Geo. R. Curtis Paving Co., Los Angeles, "A" $72,412; J. E. Haddock, Ltd., Pasadena, "A" $66,693, "B" $71,344; Griffith Co., Los Angeles, "A" $68,291, "B" $72,735; Oswald Bros., Los Angeles, "A" $68,049, "B" $76,438; Los Angeles Paving, "A" $75,543, "B" $79,193; Southwest Paving Co. Los Angeles "A" $67,505. Contract awarded to J. L. McClain, Los Angeles, "B" $65,531.70 ("A" $65,-540).

ORANGE COUNTY—Manchester Avenue, between Artesia Avenue, Buena Park, and Lincoln Avenue, Anaheim, 5.2 miles grading and portions paved with asphalt concrete. District VII, Route 174, Section A. Alternates "A" and "B". Oswald Bros., Los Angeles, "A" $111,666, "B" $127,826; Griffith Co., Los Angeles, "A" $124,504, "B" $136,805; Geo. R. Curtis Paving, Los Angeles, "A" $128,167, "B" $141,896; J. E. Haddock, Ltd., Pasadena, "A" $130,685, "B" $141,610; V. R. Dennis Const. Co., San Diego, "A" $132,025; United Concrete Pipe Corp., Los Angeles, "A" $133,103, "B" $142,383; Daley Corp., San Diego, "A" $140,668; L. A. Paving Co., Los Angeles, "A" $148,117, "B" $158,053. Contract awarded to C. O. Sparks, Los Angeles, "A" $111,025.50.

RIVERSIDE COUNTY—Between 4 miles west of Shavers Summit and Shavers Summit. About 4 miles to be graded and surfaced with bituminous treated gravel or stone. District XI, Route 64, Section B. V. R. Dennis Const. Co., San Diego, $106,748; Geo. Herz Co., San Bernardino, $109,425; Sharp & Fellows Contr. Co., Los Angeles, $111,032; Fredrickson & Watson Const. Co. & Fredrickson Bros., Oakland, $111,356; A. Teichert & Son Inc., Sacramento, $112,332; Heuser & Garnett, Glendale, $112,686; Daley Corp., San Diego, $117,042; Geo. J. Bock & Son, Los Angeles, $120,794. Contract awarded to Oswald Bros, Los Angeles, $103,-254.76.

SAN BERNARDINO COUNTY—Between San Antonio Avenue and E. city limits about 1.6 miles to be graded and surfaced with asphalt concrete. District VIII, Route 26, Section Ont. Griffith Co., Los Angeles, $28,051; Southwest Paving Co., Los Angeles, $26,613; Oswald Bros., Los Angeles, $31,414; Geo. R. Curtis Paving Co., Los Angeles, $32,134; E. L. Yeager, San Bernardino, $35,877; V. R. Dennis Const. Co., San Diego, $47,002. Contract awarded to C. O. Sparks, Los Angeles, $23,526.40.

SANTA BARBARA COUNTY—Santa Barbara County, in Montecito, about 0.6 of a mile in length, trees to be removed and disposed of. District V, Route 2, Section J. Geo. E. Rue and Frank Doan, Santa Barbara, $4,308. Contract awarded to Theo. M. Maine, San Luis Obispo, $3,595.

SAN FRANCISCO-OAKLAND BAY BRIDGE—San Francisco approaches to San Francisco-Oakland Bay Bridge. Contracts 15 and 15-A. Barrett and Hilp, San Francisco, $1,498,044; Clinton Const. Co., San Francisco, $1,221,267; Transbay Const. Co., San Francisco, $1,319,131; C. W. Calotti & Co., M. B. McGowan, Inc., Peninsula Paving Co., San Francisco, $1,418,326; Bates and Rogers, Const. Co., Oakland $1,459,627. Contract awarded to Healey Tibbitts Const. Co., San Francisco, $1,172,622.

SHASTA County—Overhead crossing over S. P. R.R. at Redding, 1-40′ st. girder sp. and 2-30′ st. girder sp's on concrete piers and approximately 237′ timber trestle approaches. District II, Route 20, Section Rdg. Nelson & Wallace, Escalon, $32,182; Harry J. Oser, San Francisco, $34,154; C. W. Calotti & Co., San Rafael, $30,312; L. C. Seidel, Oakland, $33,068; Fred J. Maurer & Son, Inc., Eureka, $30,511; John Carcano and Albert H. Siemer, San Anselmo, $31,156; B. A. Howkins & Co., San Francisco, $32,539; M. B. McGowan, Inc., San Francisco, $33,487; A. Young, Yreka, $36,683. Contract awarded to Campbell Const. Co., Sacramento, $28,979.15.

VENTURA COUNTY—Between Sea Cliff and Benham, about 3.6 miles to be graded and paved with asphalt concrete. District VII, Route 2, Sections F., G. Mundo Engineering Co. and Sander Pearson, Los Angeles, $241,910; Sharp & Fellows Contracting Co., Los Angeles, $233,088; Oswald Bros., Los Angeles, $249,774; Basich Bros., Torrance, $214,957.60.

In Memoriam

STEPHEN ALLEN ROAKE, Supervising Bridge Designing Engineer of the San Francisco-Oakland Bay Bridge, ceased his earthly labors February 3, 1935, at his home in San Mateo after an extended illness.

Steve Roake, as he was affectionately known to his associates, was born August 10, 1874, at Peekshill, N. Y., where he remained until graduating from high school in June, 1891. The engineering profession beckoned to him and early in 1892 he started the long climb up the ladder, some of the rungs being rodman for the city of New York, 1892–1895; draftsman for Elmira Bridge Co., New York; Union Bridge Co., Athens, Pa.; Pittsburg Bridge Co., Lehigh Valley Railroad, 1895–1900; American Bridge Co., 1900–1915; concrete designer for the Celluloid Co. of Newark, 1915–1917; chief draftsman, then assistant consulting engineer in the New York office of the Southern Pacific Co., 1917–1928; and then chief design engineer of the Suisun bridge in the San Francisco office of the Southern Pacific Co.

Upon the completion of the Suisun bridge in December, 1931, Steve Roake entered the office of the San Francisco-Oakland Bay bridge as a supervising design engineer, in which position he remained until ill health caused him to take a leave of absence in August, 1934.

To all these projects he brought splendid ability, untiring energy and a high ideal of duty and responsibility. He leaves behind accomplishments priceless to the Bay area and the State.

In his passing, his widow and his two sons and two daughters have lost a devoted husband and father, the world has lost an outstanding engineer, the State has lost a faithful and conscientious servant, San Mateo has lost a citizen and neighbor and the staff of the Bay Bridge has lost a friend.

A home is a little used building that usually stands on the same lot with a garage.

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Port of San Jose—Not appointed

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DEPARTMENT OF PUBLIC WORKS

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SHOWING
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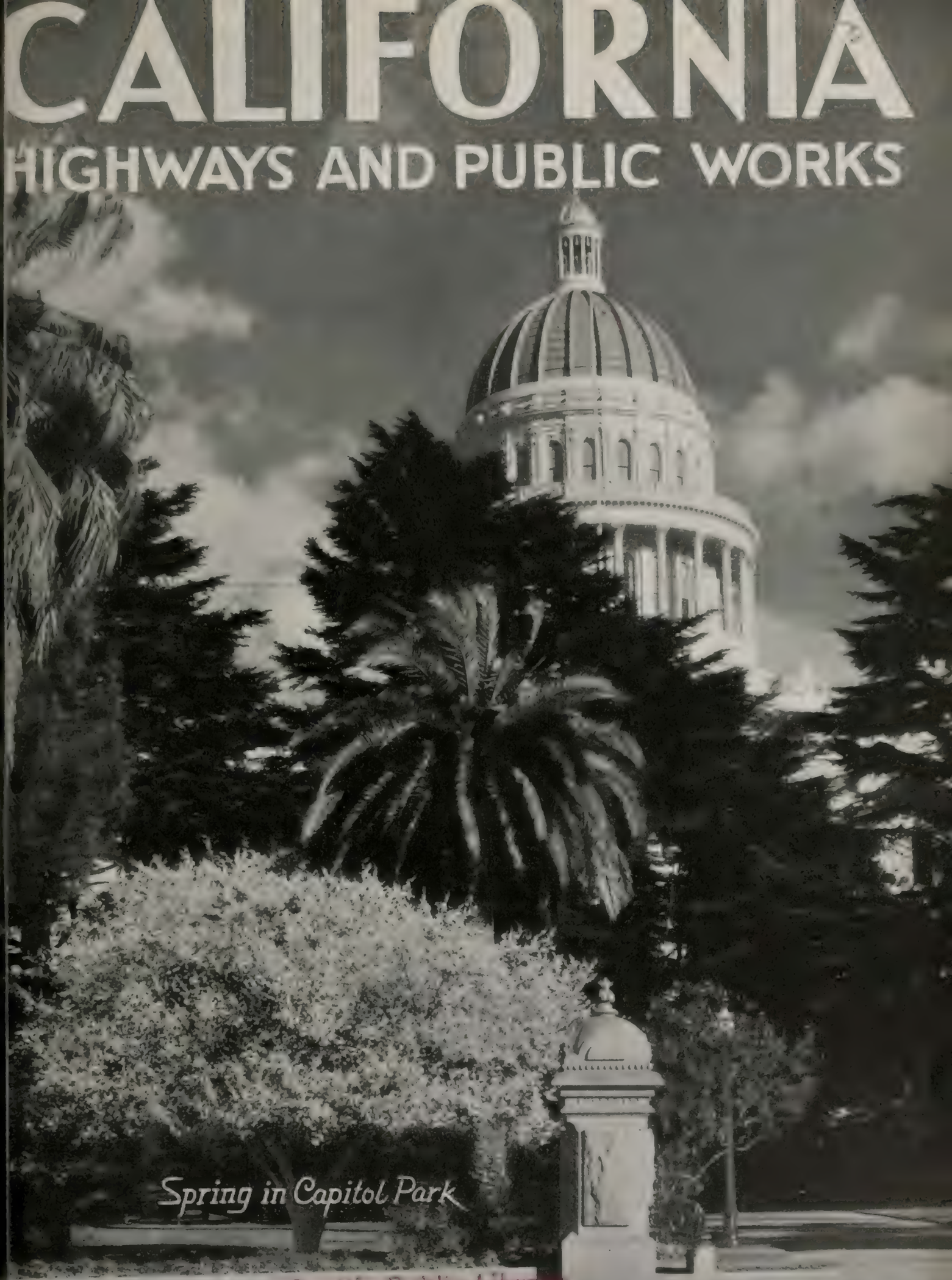
HIGHWAYS AND PUBLIC WORKS



Spring in Capitol Park

Seattle Public Library

Official Journal of the Department of Public Works

MARCH 1935

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$16,000,000 Saving for California Taxpayers In Governor Merriam's Highway Unification Plan

By **FRANK F. MERRIAM, Governor of California**

ANY public undertaking that calls for an expenditure by the taxpayers of an amount in excess of $180,000 a day for nineteen years surely must have a very important bearing on the basic interests and welfare of the people.

In any event, such was the daily cost, from 1914 to 1933, to State, county, and municipal taxpayers for the construction and maintenance of highways, roads and streets in California representing the huge total for the nineteen-year period of $1,265,000,000. The highways, roads and streets called for an expenditure by the State of $384,000,000; by the counties of $467,000,000, and by the cities of $414,000.000.

GOVERNOR FRANK F. MERRIAM

Some of these costs have been unnecessary, or have been excessive, through a duplication of effort and through the use of costly methods and equipment by road departments.

To remedy this condition, and at the same time to provide for a more effective and satisfactory development coordination of highways, roads, and streets, I have submitted a plan to the State Legislature calling for a unification of the State and county highway systems and for doubling the amount of State funds allotted to cities for street purposes.

Adoption of this plan, on the basis of available estimates, will effect a saving to California taxpayers of approximately $16,000,000 during the next two years.

All are agreed that coordination and consolidation of governmental functions is desirable both in the interests of efficiency and economy. Proposals are being earnestly advocated for the consolidation of the State's 58 counties into larger political subdivisions; some advocating that not more than five counties be organized, while others believe the number should be fifteen or sixteen.

The exact manner of reducing the number of counties is important only as it has a bearing on the results to be obtained, but it has been estimated that a merging of the counties, with the subsequent elimination of manifold duplications of effort, services and expenses, would save the taxpayers $30,000,000 in two years.

And while I am not seeking at this time to bring the problem of county consolidation before the Legislature—even though I appreciate the advantages of such an arrangement—it is worthy of note that the highway unification program now before the Legislature would save an amount equal to one-half the total savings to be accomplished by reducing the number of counties.

There is, of course, considerable opposition

(Continued on page 8)

MAR 2 9 1935

Blasting 100,000 Cubic Yards of Solid Rock Per Mile on Feather River Job

By **PERRY R. LOWDEN,** Assistant District Construction Engineer

THE general public and the Division of Highways are watching with much interest and anticipation, the progress of the highway grading projects in the Feather River Canyon.

The Feather River Highway connects Oroville and Quincy, county seats of Butte and Plumas counties, and is a part of an interstate route connecting with U. S. 40 at Reno, Nevada. It is 78 miles long, and a preliminary estimate placed the cost of grading and structures at $7,075,000. At this time the work is organized with the objective of completing the grading between Oroville and Keddie, seven miles from Quincy, during the summer of 1936. The apparent final cost of grading and structures for the 77.75 miles is $6,900,000.

Work was started on both the Oroville and Keddie ends in the spring of 1928 and has been prosecuted steadily since that date.

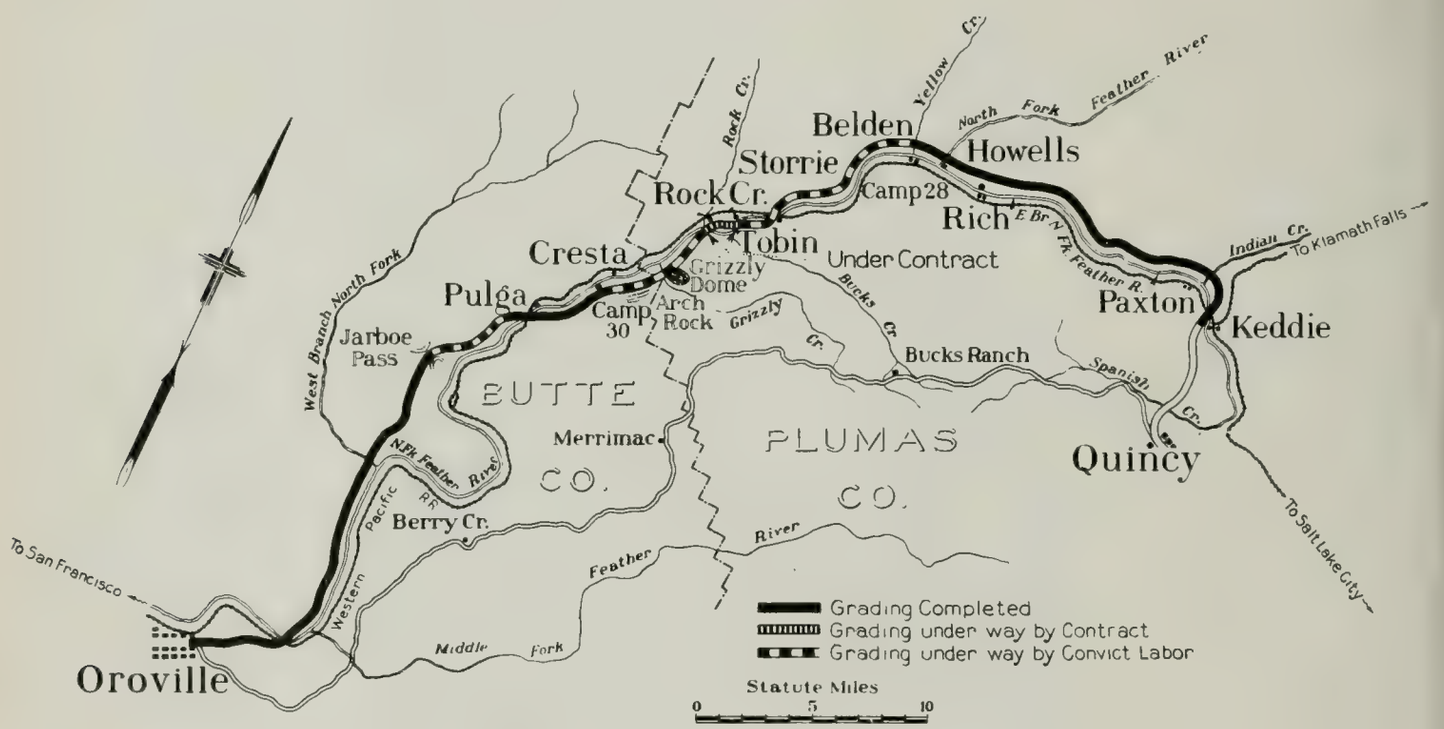
SIX GRADING CONTRACTS

There have been six grading contracts covering a total length of 14.3 miles and involving the movement of 1,456,800 cubic yards of excavation. One contract for grading 2.5 miles between Storrie and Rock Creek is due for completion in July.

The remainder of the grading is to be done by the two convict camps which started the work in 1928. To date these camps have moved 4,328,000 cubic yards in completing 43.3 miles.

In addition, six bridge contracts have been completed, and one for a bridge across the North Fork at Tobin is in progress. Two other bridges across the North Fork, one at Storrie and one at Rock Creek, are yet to be built by contract.

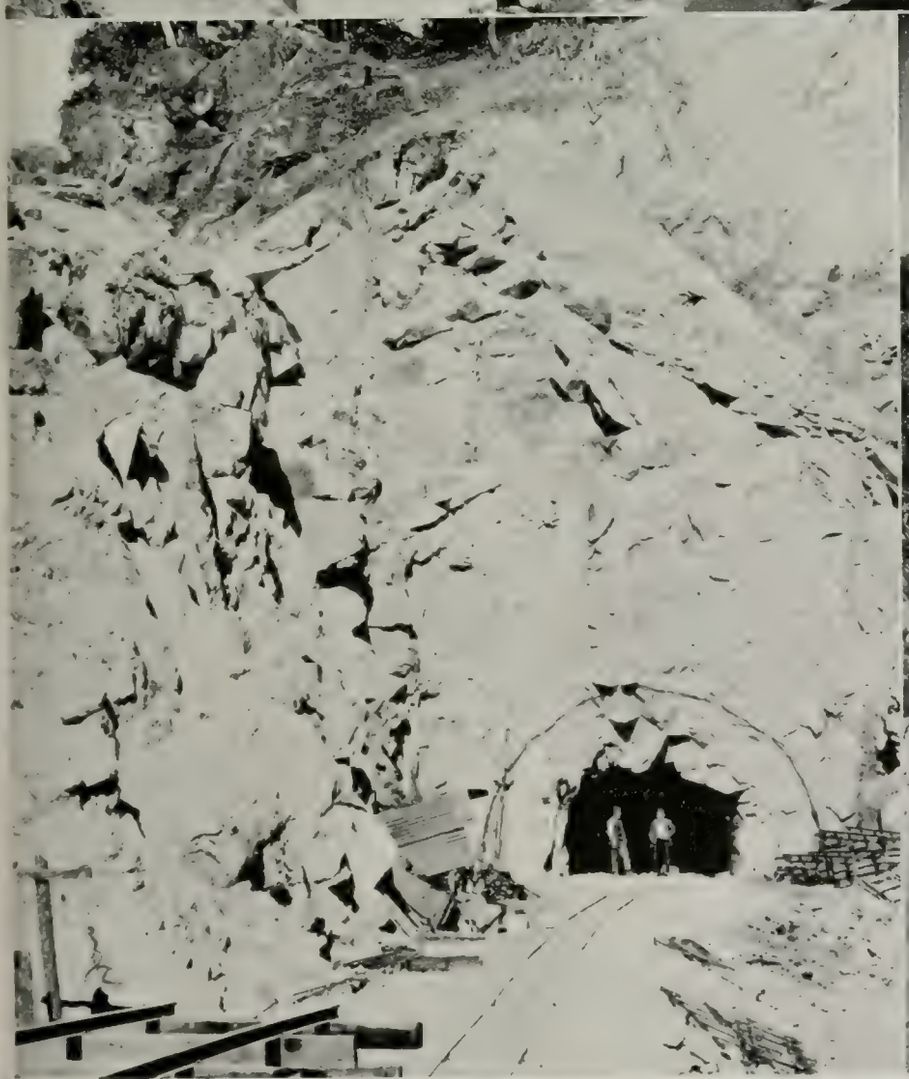
The present contract for 2.5 miles between Rock Creek and Storrie will permit access to bridge sites at Rock Creek and Storrie at either end. The construction of these bridges is planned in 1935, to permit access to the adjacent sections which will be graded by convict labor.



GRANITE DOMES ENCOUNTERED

All of the work done to date has been on the 70.75 miles between Oroville and Keddie. There remain twelve miles to be constructed

(Continued on page 15)



GREAT GRANITE DOMES of Feather River Canyon are being blasted and tunneled by highway engineers. The top picture shows the end of grading at Arch Rock where drilling operations begin. The upper line across the rock is a 4-inch airline for supplying the jackhammers. The other lines provide footholds for the men. Lower left photo shows 9 by 14 foot heading of tunnel No. 1. Outline for the completed tunnel is shown on face of portal. At lower right, men are loading drill holes on steep bare slope.

Model Built to Scale Visualizes Proposed Salinas Grade Separation

By **H. D. STOVER,** Designing Engineer, Bridges

MODELS properly constructed are a direct aid in the designing of bridges, towers, buildings, dams and various structures.

From the structural designer's standpoint, models serve primarily as a check on the analysis of stresses. Due to the increasing demand that designers visualize the functions of a structure as a whole and that the plan is such that the finished structure has a pleasing appearance and the proper proportions for the materials of construction selected, the use of models have increasing value.

In the city of Salinas, State Highway Route 2 (U. S. 101) crosses the main line and yard tracks of the Southern Pacific Railroad at grade. The crossing is in a built up section of the city at the intersection of North Main and Monterey streets. The State highway route comes into Salinas over North Main Street and turns into Monterey Street just after crossing the railroad tracks.

SPECIAL PROBLEMS INVOLVED

The construction of a grade separation in this congested business area, presents many special problems that must be satisfactorily solved for all parties concerned, such as relocation of approach roads; providing for proper sight distances for the safety of traffic; proper location of stop signs and traffic signals; providing the best possible access to property adjacent to the subway, etc.

It appeared advisable therefore to construct a model of the proposed grade separation as was done, with many resultant benefits, in the case of other grade separations, such as the Lincoln-Culver Boulevard separation on Route 60 in Los Angeles County, and the crossing of Route 9 over the tracks and yards of the Atchison, Topeka and Santa Fe Railroad in San Bernardino city.

MODEL ON DISPLAY

The placing of this subway model on display in the city of Salinas will also enable the property owners and business firms located adjacent to the proposed structure to actually visualize the conditions that will result from the completed structure, clearly bringing out certain advantages to be gained and showing property frontage that will be affected.

Also the populace of the city will be able to visualize the advantage of having the traffic separated from the present crossing at grade, thereby eliminating the costly delay that local and through traffic is subjected to, as well as providing a plaza and parked area and eliminating the unsightly view of the railroad yards. The display of this model will enable the people of the city to comprehend readily what only a few would understand from a study of plans and blueprints of the project.

CONSTRUCTED TO SCALE

The model is three and one-half feet by eight feet in size and is constructed to a scale of one inch to fifteen feet, or a ratio of one to one hundred and eighty. The base of the model consists of a main outer frame having two inch by three inch side pieces with one inch by three inch cross pieces, and an inner frame sawed to the shape of the subway walls and having cross pieces set a varying depth to form the roadway depression.

The top is a sheet of $\frac{1}{8}$ inch ply wood cut to fit around and through the subway frame, giving an unbroken, smooth surface to the subway and surface streets. The sidewalk level is built up of two layers of heavy cardboard. The surface textures, painted sandpaper represents grass and a thin application of plaster, stippled and painted, represents bare ground.

PHOTOGRAPHIC SURVEY MADE

The steel girder span carrying the railroad was modeled entirely of cardboard.

Electroliers and traffic-stop signs are of lead cast in a plaster mold.

Photographic survey was made of the site and the colors of all buildings noted. From these photographs, the miniature buildings are reproduced by sawing blocks of wood to shape and architectural ornaments are pieces of cardboard glued to the wood, the whole colored the same as the prototype buildings.

The model was constructed by Junior Designing Engineer of Bridges, T. K. May.

MODEL AND PHOTOGRAPHS picture the safety and traffic aspects of the proposed grade separation and subway improvement in the City of Salinas where a railroad crosses the intersection of the State highway and Main Street. The model, at top, shows the present dangerous grade intersection replaced by a wide subway with the railroad carried across on a girder bridge and a parked area separating traffic. Present conditions are shown in the photographs.

Survey Shows 7,802,000,000 Vehicle Miles Traffic on State Highways in 1934

By **C. H. PURCELL,** State Highway Engineer

THE Division of Highways has just completed an exhaustive traffic survey of the roads and streets of California made during the year 1934 which reveals that the total annual motor travel in the State is 16,600,000,000 vehicle miles, of which 47 per cent occurs on State highways, 11.5 on county roads and 41.5 on city streets other than State highways.

The report of this survey is the most comprehensive collection of State traffic statistics yet compiled. It represents a year's work and the employment of 14,000 checkers and statisticians in field and office, supervised by the Maintenance Department of the Division of Highways.

The survey was accomplished through financial aid from the Federal Civil Works Administration and the State Emergency Relief Administration.

C. H. PURCELL

REPORT IN THREE VOLUMES

The report of this work recently made to Governor Frank F. Merriam by Director of Public Works Earl Lee Kelly is in three volumes covering six related studies including a series of county and major city traffic-flow maps constituting the most complete and up-to-date road maps of California.

The field covered by the survey includes the amount and location of motor vehicle traffic and its outstanding characteristics, the extent of the public thoroughfares and their classification upon the basis of traffic, the relationship between governmental costs for highways and those for other purposes, and highway costs in terms of traffic. To reach this goal, six related studies were made.

Traffic counts were made on January 14 and 15, March 25 and 26, and July 1 and 2, 1934, at 2560 stations throughout California upon all classes of roads, 1334 of which stations were located outside of cities and 1226 stations within 51 cities which represented 84 per cent of the urban population of the State.

6,000,000 license numbers were recorded and the residence of owners traced to chart the origin of traffic. More than 100,000 automobiles were checked on the make of car, its age, and its gasoline consumption.

TRUCK TRANSPORTATION CHECKED

Trucking on highways was thoroughly investigated, as were expenditures and revenues of State, county, and municipal governments for the period of 1914 to 1933, especially in relation to highways.

Except for cities and counties where suitable records were available, the entire road and street mileage of the State was logged. Type and width of surface were recorded, together with pertinent data on structures and drainage. This compilation is the most accurate mileage record thus far prepared for California.

An intensive study of trucking was made between March 15 and June 30, and approximately 32,400 drivers were questioned as to their operations. The movement of agricultural products over the roads and railroads of the State was determined, particularly the

Streets and Roads Total 95,957 Miles

(Continued from preceding page)

movement into the cities of San Francisco and Los Angeles. Expenditures and revenues were compiled for State, county, and municipal governments for the period 1914 to 1933.

HIGH LIGHTS OF SURVEY

Some of the high lights developed by the survey follow:

State highways outside of cities carry ¾ of all traffic outside of cities. State highways inside cities carry ¼ of all city traffic.

State highway within cities of California have 1/18 of the mileage within the cities and carry ¼ of the traffic.

Of the total annual vehicle mileage in California, 55.6 per cent occurs within cities. The remaining 44.4 per cent of California's traffic flows outside of cities and ¾ of this rural traffic moves on roads of the State highway System.

EXPENDITURES COMPARED

The aggregate expenditures for vehicle regulation and highways since 1914 and since 1929 are given for comparison as follows:

	1914–1933	Per cent
State	$384,000,000	30.4
Counties	467,000,000	36.9
Cities	414,000,000	32.7
	$1,265,000,000	100.0

	1929–1933	Per cent
State	$185,000,000	35.1
Counties	147,000,000	27.9
Cities	195,000,000	37.0
	$527,000,000	100.0

Vehicle regulation and highway expenditures per vehicle mile in 1933 by the three governmental units were as follows:

State	$0.0046
Counties	.0126
Cities	.0040
Average	.0053

95,957 TOTAL MILEAGE

The total road and street mileage in California is 95,957 miles, of which 13,605 miles are State highways, 65,130 miles are county roads, and 17,222 miles are city streets other than those in the State highway system.

The State Highway System has 8,984 miles of high and intermediate type of surfacing. The city system has 11,427 miles, and the counties, 11,116 miles.

Approximately one-third of all the road mileage in California is of high type or intermediate type surface, which classification embraces Portland cement concrete, asphaltic concrete, oil mix and oil macadam pavements.

TRUCKS ON INCREASE

California passenger vehicles number 1,712,000 and freight vehicles, 288,409. Vehicles in California from other States in 1934 totaled 326,000.

While registration of passenger cars was decreased by the depression, truck and trailer registration is increasing.

The average motor vehicle in California in 1934 consumed 601 gallons of gasoline. This is 68 gallons more per car than was consumed ten years ago. Passenger cars averaged 15.2 miles per gallon of gasoline; trucks averaged 10.64 miles.

One-fourth of the passenger cars and trucks on the roads are more than seven years of age. The passenger cars average approximately 7250 miles a year, the trucks 9900 miles.

Expenditures for all governmental units combined and for various purposes for the 20-year period, expressed as a percentage of the total expenditures, are as follows:

	Per cent of total expenditures
Vehicle Regulation and Highways	15.8
Education	27.9
Public Protection and Benefit	35.9
General Government	8.8
Debt Service	11.6
	100.0

SOURCES OF REVENUE

The sources of revenue for all three branches of government—State, county, and municipal—for the last 20 years are as follows:

Source	Per cent of total
General Tax	58.1
Miscellaneous Revenue	17.4
Vehicle Operation Taxes	5.2
Federal Aid	0.8
Other subventions and grants (from general tax)	5.8
Sale of Bonds	12.7
	100.0

California's annual agricultural production approximates 17,000,000 tons, all of which

(Continued on page 11)

Unification Plan Eliminates Road Tax

(Continued from page 1)

to the plan I have proposed; and I entertain no criticism of those who disagree with me. It is any one's privilege to oppose, as it is mine to favor, this program.

In this proposal appears the old obstacle that confronts every attempt to change existing procedure or to economize. Which is to say, generally speaking, that we are opposed to taxes which we are required to pay, and are reluctant to favor economy in the administration of projects in which we have a direct interest.

The unification of highways as proposed in the budget I submitted to the State Senate and Assembly contemplates certain definite, specific advantages—as I have said—both from the standpoint of economy and efficiency.

Contrary to popular belief, the State's three-cent gasoline tax does not pay all the costs of constructing, improving and maintaining highways. This tax is divided between the State, the counties and the cities, one cent being allocated to the counties, a quarter of a cent to the cities, and the balance to the State.

ELIMINATES ROAD TAXES

From its share of the gasoline tax money, the State pays the entire cost of the California highway system over which flows the bulk of all traffic, outside the cities. For the construction and maintenance of the lesser-used county highways, county supervisors augment gasoline tax funds by levying taxes, special assessments and by issuing bonds—all payable by common property taxpayers.

Such road charges against home, farms and all real estate, as well as personal property, will be eliminated by adoption of the highway unification program.

Careful study of the whole problem has convinced me that the present gasoline tax is adequate to pay highway costs in California, provided the highways are consolidated under one central administration.

Hence, I have caused to be submitted to the Legislature certain proposed measures declaring all county roads to be State highways and calling for expenditure by the State of the highway funds now allocated to the several counties.

DOUBLES FUNDS TO CITIES

This plan calls for the same allotment of funds and for no reduction in the employment of workers now engaged in work on county roads.

Likewise, it is proposed to double the quarter-cent allocation of gasoline funds to the cities.

Such an increase in street funds available to the cities on the basis of their automobile registration will immediately provide for needed improvements and at the same time will benefit the city taxpayer by reducing the amount he is required to pay for the extension and upkeep of city streets.

Furthermore, provision is contained in the unification program for payment by the State, out of gasoline tax funds, of existing county highway bond interest and redemption, of special assessments and other obligations now representing such a heavy burden upon owners of real estate.

Counties of the State have heretofore issued highway bonds which will require principal and interest payments this year of $6,731,675. Under the plan submitted to the Legislature, county bonds for highway purposes not only will be unnecessary, but will be prohibited, and as soon as the counties retire their present indebtedness, county taxes now levied for the retirement of such indebtedness will be eliminated.

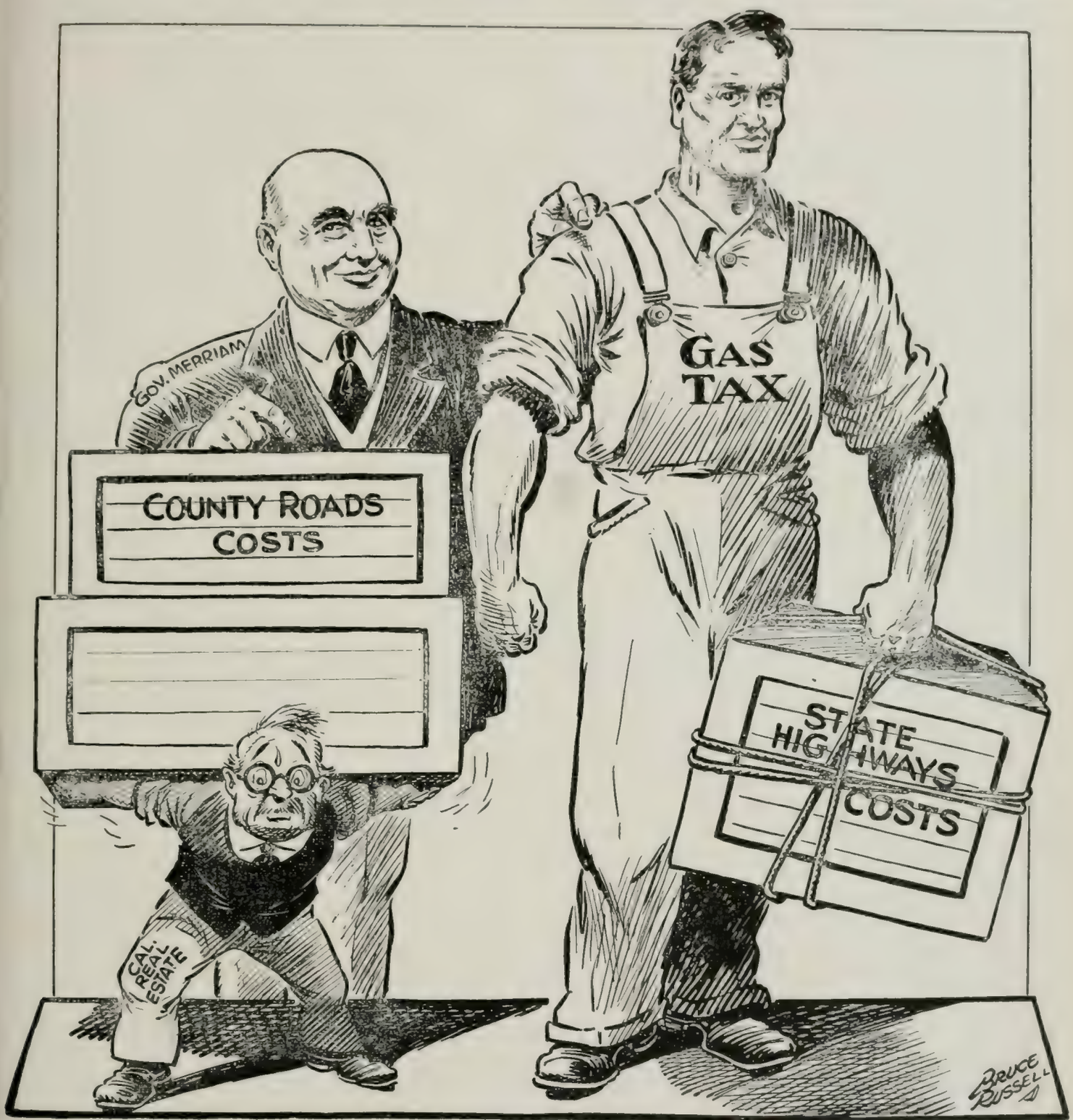
COUNTY CITIZENS EMPLOYED

The special assessment evil in rural districts will be automatically abolished.

Under the proposed plan, rural road agencies will be established for road petitions and men will be employed from the county in which road work is required. County road equipment and stations, wherever needed, will be operated by the State. The duplication of overhead and middleman costs in the present county system of road building—now calling for excessive expenditures—will disappear.

Unless the proposed plan is approved, the sums borrowed from the State by the counties under the Relief Bond Act of 1933 must be repaid, beginning in 1938, thus necessitat-

Where the Extra Load Should Be Shouldered!



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ing either additional county taxes or a reduction in county road work. Adoption of the unification plan will make such repayments unnecessary and will assure uninterrupted work on roads now included in the county system.

Provision for doubling the amount of gasoline tax money allocated to cities will add $3,000,000 a year to be expended upon city streets other than State highways. The majority of State highways within cities were taken over by the State in 1933 and are now being brought up to requisite standards.

THIRTY PER CENT SAVING POSSIBLE

As such improvements are made in highways traversing city territory the resultant decrease in expenditure for this purpose will allow increasing funds for regular street improvement.

It is estimated that the State can maintain

(Continued on page 10)

Plan Doubles Gas Tax Funds to Cities

(Continued from page 9)

and improve county highways at a saving of approximately 30 per cent under present costs, and that increased efficiency in highway operations will represent further advantages.

An example of the improvements and added benefits that may be expected from coordination of all our highways is afforded by the results that followed taking over by the State highway department of more than 6600 miles of county roads in 1933. Investigation by State engineers of these roads revealed the fact that more than 600 of the 1935 bridges in the county road system were in such condition as to necessitate immediate repairs and improvements for the protection of life and property.

This work was accomplished promptly under State management.

The State Department of Public Works is now completing a survey financed by the Federal government, and costing $500,000, which will give California citizens an accurate and valuable compilation of facts relative to all aspects of highway construction, maintenance and costs.

HIGH COUNTY EXPENDITURES

Information already available from this survey shows that the counties, during the period from 1914 to 1933, spent almost $100,000,000 more on county highways than the State spent on the State highway system. The report likewise shows that the county roads, while costing so much more than the State highways, actually carry only a little more than 11 per cent of the State's automobile traffic.

The bulk of the approximately half-billion dollars spent by the counties in the last 19 years for roads has come from the pockets of owners of real estate and personal property.

In virtually all of its aspects the road measures proposed in the budget must be regarded as tax relief recommendations. And while adjustments in other brackets of our system of taxation have necessitated certain additions or an effort to obtain revenue from new sources, the highway unification program not only calls for no increase whatsoever, but provides for a substantial reduction in local taxation.

STATE HAS FINE RECORD

The highway program of the State of California over a long period of years has established a record which the Federal government authorities and the officials of other States regard with admiration. Our engineers and other department personnel have done fine work and earned universal respect for their efficiency and for the general economy of their construction and maintenance operations.

The services of this splendid corps will be made immediately available to the several counties if the consolidation program is approved.

Broadly speaking, San Francisco County will be unaffected with respect to county roads, as San Francisco is a consolidated city and county, but San Francisco would obtain street funds exactly double the amount now apportioned to the combined city and county.

And in Los Angeles County, for instance, where automobile registration is heaviest, the 43 incorporated cities in that county would receive a tremendous addition to their available street funds.

TAKES BURDEN FROM TAXPAYERS

Summed up, the unification plan provides for extensive savings in actual costs and, hence, a resultant reduction in local taxation. The plan would shift to the State, without any additional cost to any group of taxpayers, a burden now borne by owners of real estate and personal property. It would extend needed relief in many special assessment districts and would assume the obligation for county road bond interest and redemption payments.

Objections to the plan arise mostly from local bodies who, with understandable pride in their own accomplishments and communities, prefer to maintain existing conditions.

If benefits are to be obtained, however, we should approach this question from the standpoint of the greatest good for the greatest number. Close scrutiny of the program as now pending in the Legislature will demonstrate the fact that such benefits will be assured if the plan is adopted without substantial modification.

U. S. Tests Indicate Day Labor Costlier Than Contract Jobs

UNDER the regulations prepared by the U. S. Bureau of Public Roads governing Federal emergency highway construction, provided for by the National Industrial Recovery Act, one project in each State on which contractor's bids had been taken was to be selected at random to be done by force account, or day labor. The purpose was to provide a basis for comparison of the relative merits of contract and day labor construction on public work.

This test was arranged as a result of insistent demands from various sources that all Federal emergency highway construction be done by day labor on the claim that it could be done cheaper by this method than by contract. Results of the test, according to a statement by Thomas H. MacDonald, chief of the Bureau of Public Roads, testifying at a recent hearing conducted by the House roads committee, are showing an average of 30 per cent in favor of the contract method of constructing highways. Ninety per cent of all projects reported, he stated, show an advantage in favor of the contract system. This bears out the results of investigations conducted by the Associated General Contractors of America on specific projects as work progressed, which indicated the costs of day labor were running high.

In the course of his testimony before the House roads committee Mr. MacDonald makes acknowledgement of the important services rendered by contractors in carrying out the emergency highway program. "I pay sincere tribute to the spirit of the State highway departments and to the contractors on the whole, in the administration of, and compliance with the laws. It would be surprising to you, I believe, to know how few complaints have reached the bureau of unfair treatment of labor by contractors or by State highway departments, either as to wages or as to the classification of the different groups." Answering an inquiry as to contractors' profits Mr. MacDonald declared "the contractor's profit, as a general proposition, has been almost non-existent ever since the depression began, and there is a considerable question in my mind whether we have paid fair prices." —*Southwest Builder and Contractor.*

So live that you won't shudder every time a red cap drops your grip.

TIN CENTAURS

By Tom T. Ness

When ancient legends we absorb
We learn that Cyclops had one orb—
A baleful eye in mid-forehead,
Inspiring mortal awe and dread.
Another bit of fantasy
Evolved the queer Acephali;
A race of headless men, they were—
Devoid of brains, one might infer.

And yet, today, within our ken,
There is a breed of brainless men.
We also know there is no dearth
Of one-eyed ogres on our earth.
At night the terror-striking twain
Haunt almost every auto lane.
When darkness dims the moon and stars,
Ride headless men in one-eyed cars.

SURVEY SHOWS 7,802,000,000 VEHICLE MILES TRAFFIC ON STATE HIGHWAYS IN 1934

(Continued from page 7)

moves over highways to a greater or less extent. Approximately 5,000,000 tons during the year were delivered from farm to railroad in the county of production and 12,000,000 tons moved by truck to canneries, packers, market centers, or to remote rail shipping points.

Approximately 1,500,000 tons moved to Los Angeles and San Francisco markets. Of the total tonnage received at the Los Angeles market, 83 per cent came by truck, and two-thirds of that to San Francisco moved in by truck.

HIGHWAY BUILDING A "DYNAMIC RESPONSIBILITY"

Only about 5 per cent of all American rural roads are well paved—about 160,000 miles. Of the busiest roads, the main State highway systems which carry upwards of two-thirds of all traffic, about one-half are still mud or dust roads.

Such facts as these led the Committee on Post Office and Post Roads to make this statement to Congress: "Highway construction is a dynamic and continuing responsibility. Highways either grow worse or better. They can not stand still with 25,000,000 vehicles in daily operation * * *. With over 30,000 deaths and 750,000 injuries each year from automobile accidents, the elimination of traffic hazards must receive not only continuous but better attention."—*Exchange.*

Automatic Radio Invention of Engineer Ingersen Broadcasts Flood Warnings

THE STATE OF CALIFORNIA is now operating a series of automatic radio stream gage transmitters in connection with flood control and watermaster service activities of the Division of Water Resources.

The use of these radio stream gage indicators serves the public interests in California in a very vital respect. During major flood conditions advance information on the rapid fluctuations of streams on which they are installed make them of paramount importance in the saving of life and property. In the watermaster activities the saving of water and crops and the protection of individual water rights of major importance. It is believed that no higher character of use of radio on land can be made than to protect the citizens of the State from potential flood hazards and to assure an equitable distribution of water.

Following an actual demonstration of the use of one of the devices the State Engineer's office installed a series of these transmitters to determine their adaptability to the division's work, with the result that a total of thirteen radio stations along the streams of California have been installed. The apparatus is semi-portable in character, and is readily installed in the standard stream gaging station instrument shelter houses at the points most desired during the course of the season.

SIGNALS STREAM HEIGHT

The radio transmitters, entirely automatic in operation, at frequent intervals send out a signal indicating the gage height of the stream at the moment. The signal is received in the State Engineer's office in Sacramento.

The fluctuations of stream flow in the major rivers contributing to the potential flood hazards in the valleys can be observed directly and a c c u r a t e l y many hours in advance of the time when the crests of the high water would reach critical points on the valley floor. By means of this advance information a better, safer, and more satisfactory operation of the various flood control and relief structures along the river can be accomplished.

Without this new medium of radio communication, it is necessary to set up an elaborate system of telephone, automobile, and other facilities to obtain the important data of the stream flow in advance of the time of arrival of the flood crests at critical points. Such manual dependence often breaks down during the course of major rainstorms and flood flows and the desired information at best is sketchy.

AIDS IRRIGATION WORK

The problem of efficiently distributing irrigation waters in the adjudicated stream systems in the State is greatly aided with the use of the radio stream indicators. Usually the transmitters are installed on the stream above diversions, at a point which is relatively remote or inaccessible. The watermaster, by listening in at frequent intervals during the day, can be informed of the fluctuations in the water supply to the irrigated area, and his time is therefore spent along the lower reaches of the stream where he is most needed to give many water users their due and proportional share of that supply.

Without the radio indicator it would be necessary for the watermaster to make a daily trip to the head of each stream in his jurisdiction to first determine his supply before he could make an accurate distribution of flows into the various dependent diversions. Aside from the saving of time and traveling costs, many instances can be pointed out where the timely indication of a sudden fluctuation of supply at the head of irrigation resulted in very material savings in water and of crops.

These automatic radio stream gage indicators are made possible by the use of a unique automatic keying device which was originally developed privately in 1931 by Associate Hydraulic Engineer Irvin M. Ingerson. Letters patent cover the apparatus.

OPERATED BY KEYING DEVICE

The automatic keying device consists of a series of commutators that are so arranged as to "key" the radio transmitter to give a signal that is the accurate gage height of the stage of the water at the time of transmission. For instance, a gage height of 7.42 feet would be listened to as being seven short dashes, at one-

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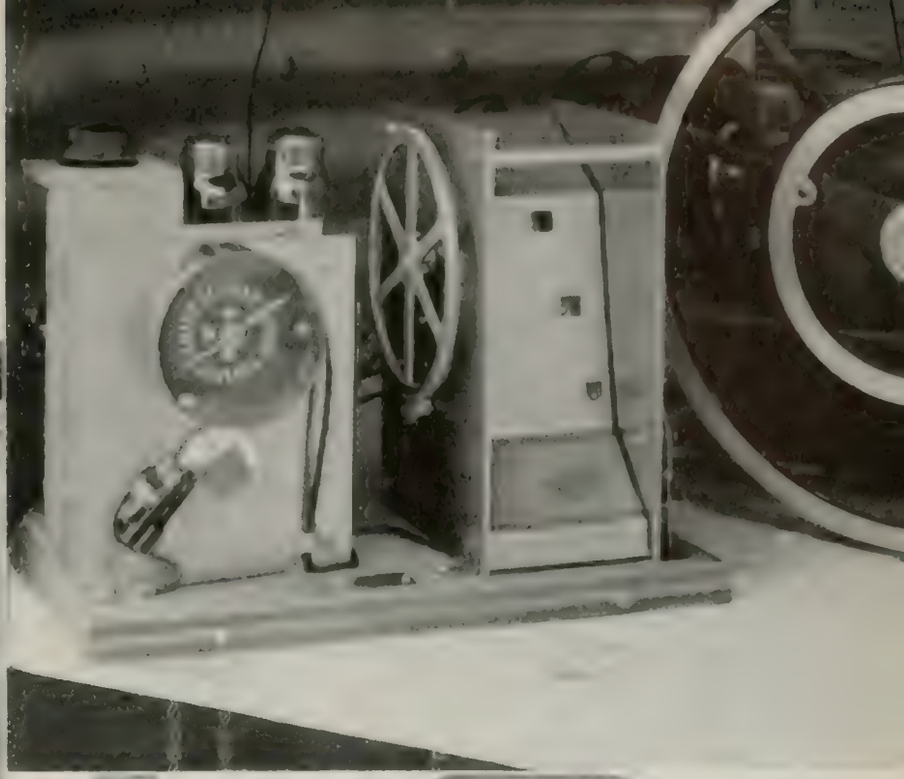

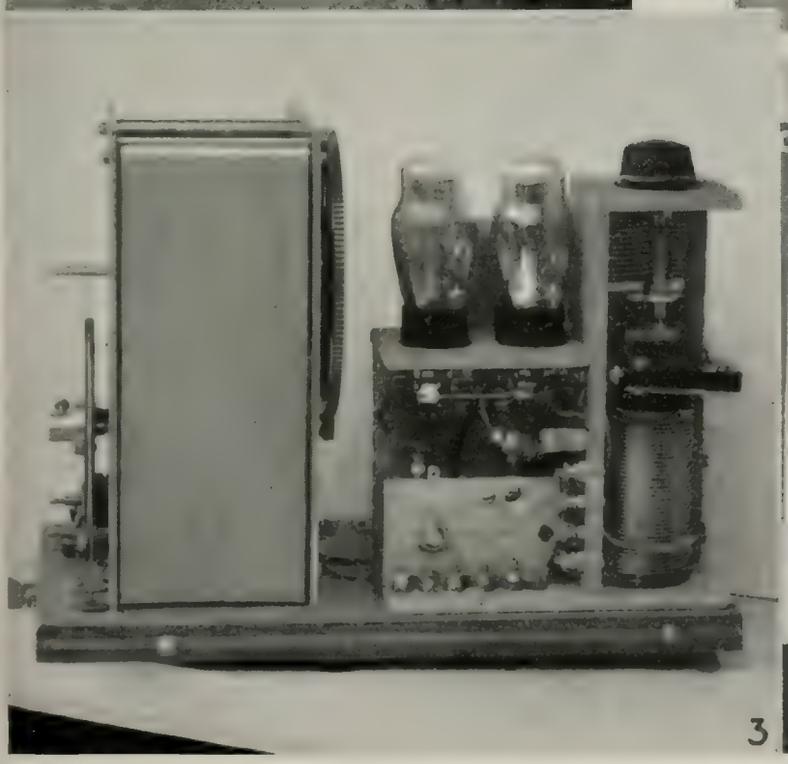

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ON GUARD in little shelter houses along 13 California streams is this Ingerson automatic radio stream gage signal apparatus that sends out warnings of flood dangers. Front and rear views of the gage keying device and transmitter are shown in pictures 1 and 2 and inventor Irvin M. Ingerson, associated hydraulic engineer of the Division of Water Resources is shown with the installation in No. 4.

States List 23,192 Road Projects for $1,699,021,390 of President's Work Fund

IN HIS message to the Congress January 4, 1935, President Roosevelt said:

"This new program of emergency public employment should be governed by a number of practical principles: (a) All work undertaken should be useful * * * affords permanent improvement. (b) Projects should be undertaken on which a large percentage of direct labor can be used. (c) The projects undertaken should be selected and planned so as to compete as little as possible with private enterprise * * *.

"This work will cover a wide field, including * * * improving existing road systems and in constructing national highways designed to handle modern traffic and in the elimination of grade crossings * * *."

9467 PROJECTS READY

Reports from State highway departments to the Association of State Highway Officials indicate that 9467 road projects on Federal aid and State road systems, estimated to cost a total of $691,534,310, are in a stage which would permit them to be quickly put under contract and 13,725 additional projects totaling over $1,000,000,000 can be put under construction within one year.

The former projects are classified as follows: 1756 grade separation projects, estimate cost, $184,314; 161 highway intersections, $20,240,000; 4645 highway construction projects, $332,153,000; 621 routes through cities and city by-passes, $72,530,000; 2285 weak and narrow bridges to be improved, $86,457,000.

AVAILABLE WITHIN A YEAR

Projects that can be put under contract within one year are reported as follows: 2302 grade separations, estimate cost $277,567,500; 182 highway intersections, estimate cost $27,312,500; 6087 highway construction projects, estimate cost $447,513,580; 1118 highways through cities and city by-passes, estimate cost $131,202,800; 3041 weak and narrow bridges, estimate cost $129,131,700.

California projects listed number 1243 with a total estimated cost of $135,078,000. They are divided as follows: for early construction, 410 projects, cost $36,378,000; available for contract within a year, 833 projects, cost $98,700,000.

California projects for early construction are classified as follows: 150 grade separations, $24,678,000; 4 highway intersections, $1,100,000; 115 highway construction projects, $6,000,000; 11 routes through cities and city by-passes, $2,000,000; 130 weak and narrow bridges to be improved, $2,600,000.

Projects reported by California available for contract within a year are: 577 grade crossings, $72,000,000; 4 highway intersections, $1,100,000; 105 highway construction projects, $20,000,000; 17 routes through cities and city by-passes, $3,000,000.

CALIFORNIA RANKS FIFTH

For immediate construction other western States report the total number of projects and estimated cost as follows: Arizona, 66 projects, cost $9,065,500; Colorado, 380, cost $13,830,000; Idaho, 62, cost $3,577,000; Montana, 82, cost $7,225,000; Nevada, 291, cost $1,942,500; New Mexico, 67, cost $3,735,000; Oregon, 58, cost $9,000,000; Utah, 121, cost $5,735,000; Washington, 160 cost $12,402,000; Wyoming, 39, cost $2,800,000.

The largest volume of available work reported by any State is $61,350,000 for 1008 projects in Pennsylvania. New York is second, reporting 453 projects estimated to cost $51,700,000. Ohio is third with $45,400,000 for 686 projects, Wisconsin fourth with $44,590,000 for 298 projects and California fifth with $36,378,000 for 410 projects.

MEET PRESIDENT'S DEMANDS

In publishing the projects listed by the States, the American Association of State Highway Officials says:

The building of these roads would meet the policies of Public Works expenditures demanded by the President, for they are:

1. Useful—affording permanent improvement.

2. Over 80 per cent of the outlay goes to wages.

3. The projects are planned and fit into a definite system of highways.

4. Do not compete with private enterprise.

Three Feather River Tunnels Under Way

(Continued from page 2)

before through traffic can make use of any of this road. Of this, 5.6 miles are between Belden and Storrie. Construction of these remaining sections will require the excavation of 1,377,000 cubic yards of material.

On the four mile section across Arch Rock and Grizzly Dome, there are over 600,000 cubic yards of solid granite. The location of this section is along the south side of the canyon on the opposite side of the river from the Western Pacific Railroad. The bare, hard, granite surfaces extend from the water's edge on slopes ranging from 38° to 60° and to heights of 1000 to 2000 feet.

Some vegetation has found a foothold in the crevices, and there are occasional areas of blocky granite where trees of fair size are growing. Over a considerable portion of these areas men are able to walk by following the crevices, and where this is impossible, ropes must be used for support while a trail for the drilling crew is constructed.

CONSTRUCTING THREE TUNNELS

Included in the work on this section are three tunnels which are to be constructed to provide for a 24-foot roadway and a 2-foot walk on each side. These tunnels are to be constructed at locations where heavy cuts are impracticable due to the amount of excavation required and the difficulty of removing this mass of material without filling the river channel.

Tunnel No. 1 on the westerly end of the Arch Rock section 33 miles east of Oroville, is 265 feet in length. Tunnel No. 2, 0.7 of a mile farther east is to be driven for 165 feet almost under that famous slab of granite known as Arch Rock. Tunnel No. 3, 400 feet long, will carry the highway through Grizzly Dome, a huge dome-shaped mass of bare granite which rises precipitiously for over a thousand feet above the river just east of the mouth of Grizzly Creek, 34.6 miles east of Oroville.

All of the work remaining, with the exception of the two bridges, is to be handled by the two convict camps now working, one at each end of this section. Camp 30, located near Cresta, 31 miles east of Oroville, works 150 convicts and employs 85 free men. Three $1\frac{1}{4}$ cubic yard Diesel power shovels are used at this camp. Camp 28, located near Rich, 53 miles east of Oroville and 24.75 miles west of Quincy, works 90 convicts, 45 free men and two $1\frac{1}{4}$ cubic yard Diesel shovels. Free labor supervises the work of the convicts, operates and maintains equipment and does other skilled work required.

DETOUR BUILT IN RIVER

One of the greatest problems on the lower section which is being handled by Camp 30, is the difficulty of access for any large force. In order to provide for the operation of the several shovels, a pioneer trail must be constructed well in advance. The tunnels present a serious obstacle. To avoid waiting several months while the first tunnel was being driven, a detour was constructed by building a fill entirely in the river.

Although this fill will be taken out by high water, it has permitted the advance of the drill crews and the head shovel to Tunnel No. 2, where a detour is being constructed in the same manner. Tunnel No. 3, which is approximately one mile beyond Tunnel No. 2, presents a more serious problem. A detour is impracticable and all equipment must pass through the tunnel to reach the work beyond.

Compressors have been set up on the railroad right of way, the air is piped across the river, and work has been started on a 14'x14'

(Continued on page 30)

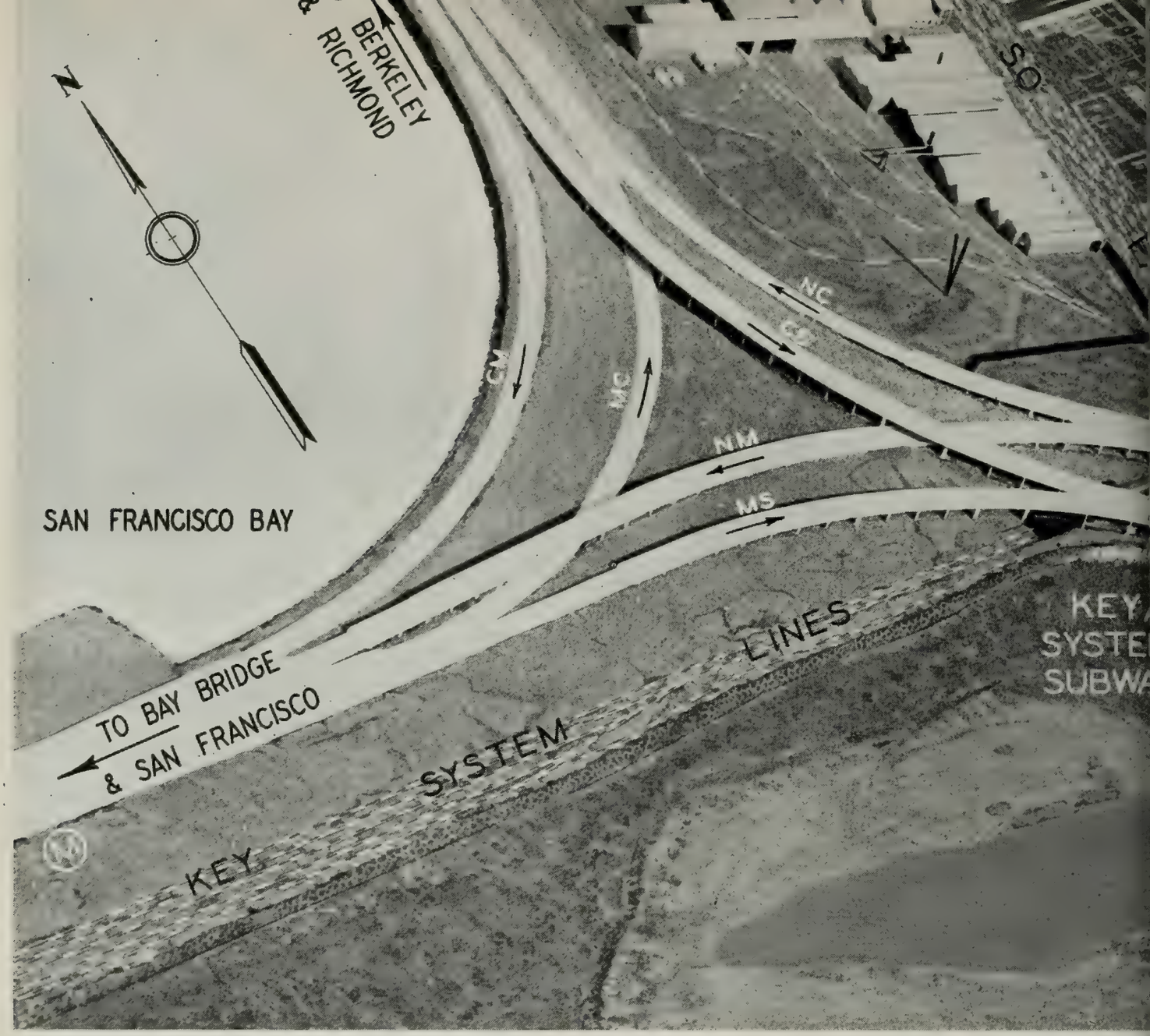
RIBBON OF WHITE

At break of day we motored away
With a jest and a lilt of song.
No thought gave we to that ribbon of white
Dividing the traffic from left to right,
As we merrily motored along.

Through a bank of fog at eventide
Our steps we retraced that night.
With landmarks gone, and we alone,
How thankful then for that ribbon of white—
A light to guide us home.

At Life's glad morn, we, careless and free,
No thought for landmarks, we;
But when shadows fall, at Death's drear night,
Faith in our God is the "ribbon of white"
That leads to Eternity.

—Mabel Miller Freeman,
In California Federation News.



"N"—North twin structure. "S"—South twin structure. "A"—Southerly branch of East Shore Hi approach. "AN"—Travel from "A" line to north structure. "SA"—Travel from south structure to "A" li from north structure to "C" line. "CS"—Travel from "C" line to south structure. "NM"—Travel from nort to mole approach. "MC"—Travel from mole approach to "C" line.

Distribution Structure as Planned for

By **P. O. HARDING,** Senior Bridge Field Engineer

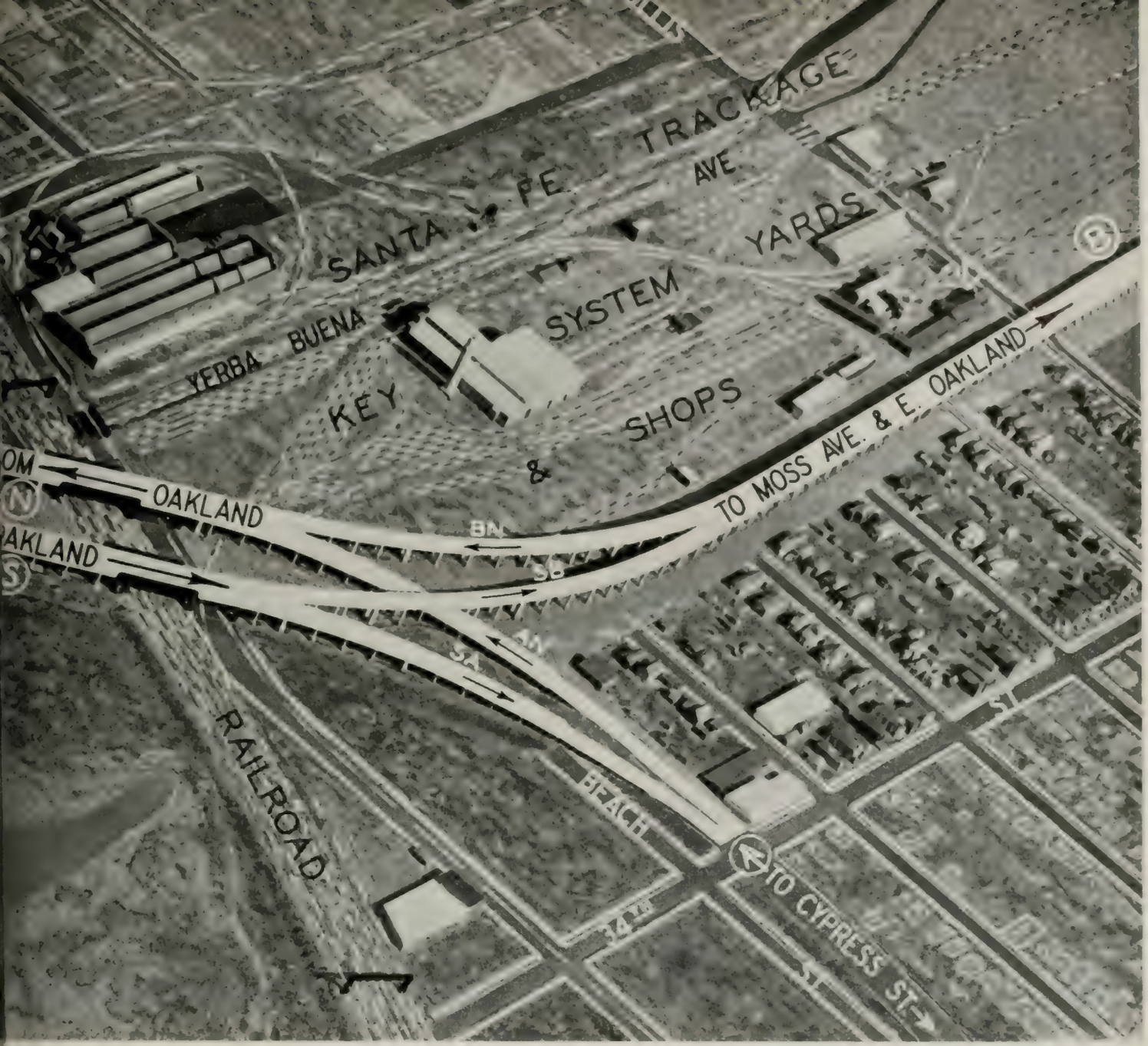
BIDS will be taken, at an early date, for a portion of the East Bay highway approach system of the San Francisco-Oakland Bay Bridge, on what is commonly termed the "Distribution Structure," the name implying the function of the structure, together with its connecting roadways.

A plan view of the Distribution Structure has the appearance of two octopi engaged in a mortal combat, but its function in the distribution, and segregation of motor vehicle traffic to and from the East Bay area will be much simpler than a first glance at the structure would indicate.

The approaches to every major bridge serving metropolitan areas have presented individual problems, the solution of which has been influenced by certain controlling factors peculiar to that particular project.

DIFFERENT APPROACH PROBLEMS

The San Francisco-Oakland Bay Bridge, for example, presents entirely different approach problems at its two ends. Generally speaking, the San Francisco downtown district is "journey's end" for the mass of users of the bridge, the San Francisco business district being a focal point of destination. The bridge enters almost the heart of the city high in the air, and the approach problem is one of getting



"—Central branch approach. "C"—Northerly branch of East Shore Highway. "M"—Mole or main line Travel from south structure to "B" line. "BN"—Travel from "B" line to north structure. "NC"—Travel to mole approach. "MS"—Travel from mole approach to south structure. "CM"—Travel from "C" line

land Approach System of Bay Bridge

down into downtown San Francisco, where any number of city streets shortly lead the motorist to ultimate destination.

The East Bay approach problem is one of distance, collection, and distribution. Here the bridge structure at its easterly end terminates two miles from shore in the shallow water and tide flats, and the approaches assume the nature of arterials functioning as a collection system tapping a vast residential area, yet connecting with and becoming a part of the State highway system.

FUNDAMENTALS INVOLVED

The original problem of locating the East Bay approach system required by the Reconstruction Finance Corporation, and later adopted by the Legislature as official approaches to the bridge, involved two fundamental considerations:

1. Tapping the East Bay area so as to serve the thousands of daily users of the bridge, who, through tolls, pay off the millions of dollars invested in the project.

The guide in this phase of the problem was a detailed origin and destination traffic survey, made under the supervision of Lester S. Ready, consulting engineer, by the California Railroad Commission technical staff, and generally reported in the Hoover-Young report of August, 1930.

Viaducts Make 16 Grade Separations

(Continued from preceding page)

2. So locating the approach arterials that they would ultimately become portions of State highway through routes.

A guide in this phase of the problem was the public demand for an East Shore industrial highway extending between San Jose and Richmond, comparable to the Bayshore Highway now nearing completion between San Jose and San Francisco on the west side of the bay. There was also public demand for the westerly extension of State highway Route 5 through Oakland, in the general vicinity of Moss Avenue, which had become a commonly used route of travel—not because it was originally planned as such, nor because it was suited for heavy travel, but because of the lack of any traffic artery through this section of Oakland.

LOCATION OFFICIALLY ADOPTED

After comprehensive economic studies had been made, the official approach system adopted in the East Bay area was the extension easterly as far as 38th and Market Street of the east and west main bridge approach as a part of State highway Route 5, and the adoption for immediate construction of the East Shore highway from Seventh and Cypress Street in Oakland, to and connecting with Ashby Avenue in Berkeley. The Distribution Structure is located at the intersection of these two important State highway routes.

In these days of automatic telephones, automatic elevators and escalators, automatic cafeterias, and even automatic traffic signals, an automatic separator, segregator, director, and distributor of motor vehicle traffic has its place in the modern scheme of development of this country.

There have been a number of designs for segregating traffic at intersecting important cross highways, those most commonly known being the traffic circle where the intersecting highways cross at grade, and the cloverleaf, where they cross at separated grades.

The braided crossing in Marin County, a special design in District IV, Division of Highways, described in December, 1930, issue of "California Highways and Public Works," was one treatment of this subject meeting a special condition for segregating the main highway traffic of the Redwood Highway from traffic serving close-by Marin County towns.

PROVIDES GRADE SEPARATIONS

The Distribution Structure for the East Bay highway approach system to the bridge, however, not only provides highway grade separations for all its cross roadways of highway traffic, but also provides grade separation for the main line steam trains of both the Southern Pacific and Santa Fe Railroads, and for the suburban electric lines of both the Southern Pacific Company and the Key System totaling in all 16 grade separations.

The Key System has, for many years past, crossed the Southern Pacific and Santa Fe tracks in this vicinity, by means of a subway, which precluded from the start any serious consideration of any subway design for the Distribution Structure. It also forced any traffic circle design overhead.

Such a traffic circle design was considered, with approximate inside radius of 200 feet, but the economic time loss in 1940, compared to the present structure, capitalized at 7 per cent, amounted to more than three-fourths of a million dollars, based on an average time value of one cent per vehicle minute, which is a value considerably below that used in similar analyses elsewhere in the country. This figure did not include any capitalized vehicle operating costs, which further favored the present design.

CLOVER LEAF REJECTED

A semi-clover leaf design was also considered, which showed capitalized vehicle operating costs, based on 1940 estimated traffic, of more than one-half million dollars in favor of the present structure, this being exclusive of any time differences, which also favored the design decided upon.

The accompanying photograph of a model, constructed under the supervision of the City Engineer of Oakland, Walter Frickstad, shows the design adopted, and clarifies at a glance many of the questions and answers to the numerous phases of this problem.

It will be noted that there are twin structures crossing the numerous railroad tracks in the vicinity, for convenience in analysis designated as "N" (North) and "S" (South).

Approach Planned to Accommodate 29,800 Cars per Day in 1940

(Continued from preceding page)

For similar convenience in designation, the southerly branch of the East Shore highway terminating under the official bridge approach system at Seventh and Cypress Streets in Oakland, has been called the "A" line. The Central Branch, terminating at 38th and Market Streets, of the legislative bridge approach system, has been designated the "B" line. The northerly branch of the East Shore highway, officially terminating at Ninth and Ashby in Berkeley, has been called the "C" line, and the main approach to the west has been designated the "M" (mole or main) line.

COMBINATION MARKINGS

For the various connecting roadways of the Distribution Structure itself, a combination of two letters indicates both the roadway and the direction of travel upon that roadway. For example, "AN" indicates the roadway and the direction of travel from the "A" line to the north structure, "SB" the roadway and direction of travel from the south structure to the "B," or central approach line, etc.

A careful analysis of local bridge traffic alone, indicates that the "A" line, or southerly approach, will carry approximately 47 per cent, the "B" line, or central approach, approximately 28 per cent, and the "C" line, or northerly approach 25 per cent of the total bridge traffic. The "M" line naturally carries 100 per cent of this traffic, which has been estimated by Mr. Ready at 10,000,000 vehicles per year, or roughly, 30,000 per day, in 1940.

The preceding figures exclude the local traffic of the East Shore highway, which has been estimated at 10,000 per day in 1940, also a smaller amount of local traffic between the "B" and "C" lines, central and north approaches, respectively.

The north and south twin structures represent the segregating units of distribution, which will be put to the most severe test during the peak hour of travel. All traffic on each of these structures is in the same direction.

JOB OF SEGREGATING LANES

Approximately 45 per cent of this traffic will be straight through traffic, and 55 per cent, or 860 vehicles per peak hour, will require segregation in the form of weaving

ESTIMATE OF TRAFFIC

Assuming a return to normal business conditions by 1940, combined bridge and local traffic is approximately estimated on the Distribution Structure as follows:

Line	To and From	Ultimate No. of Traffic Lanes	Vehicles per Day	Vehicles Peak Hour
"A"	Downtown Oakland, Alameda	6	24,000	2,260
"AN" and "SA"		3	12,000	1,130
"B"	Residential Oakland, Piedmont, East Oakland	4	9,400	880
"BN" and "SB"		2	4,700	440
"C"	Emeryville, Berkeley, Albany, Richmond	6	18,400	1,730
"NC" and "CS"		3	5,500	520
"CM" and "MC"		3	3,700	350
"M"	San Francisco-Oakland Bay Bridge	10	29,800	2,800
"NM" and "MS"		3	11,200	1,050
"N" and "S"	Twin Structures	5	16,700	1,570

from one inner lane to an adjacent inner lane within the 500 foot length of the structure. This hourly rate is equivalent to an average of 14 per minute, which may reach 20 per minute at times during the rush hour.

This means (taking the "S" structure for example) that approximately eleven vehicles from the "C" line destined for the "A" line must segregate themselves with respect to nine vehicles per minute from the "M" line, destined for the "B" line. Diagrams show that with all vehicles moving in the same direction, it will be impossible to cause anything more than a momentary slowing of traffic in the segregating lanes, for far heavier traffic than that anticipated for the year 1940.

Minimum radius curves of 1000 feet, and maximum grades of 4 per cent up and 5 per cent down, have been used in the design.

Detailed structural design and construction is under the supervision of C. E. Andrew, Bridge Engineer for the San Francisco-Oakland Bay Bridge. General control features of design, as affected by the highway approach requirements to the bridge, are under the jurisdiction of Colonel Jno. H. Skeggs, District Engineer, District IV, San Francisco.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 MARCH, 1935 No. 3

More Highways Needed

California, as often has been said, is proud of its State highway system, and of those other roads that have been improved by counties and cities to meet the ever increasing demands of motorists. Other progressive states also have reason to congratulate themselves because of their achievements.

And yet, taking the country as a whole, there are four times as many cars per mile of good road as there were in 1915.

In other words, motor vehicles are increasing in number more rapidly than the hard-surfaced highway program is going forward. Today's improved roads are at least six times busier than they were 20 years ago; for not only are there more cars per mile, but an average car is operated more miles per day.

Automobile ownership increased 1,000,000 vehicles in 1934, in this country; but road construction lagged in most localities. * * *

While the more advanced States have given thoughtful attention to their chief arteries of traffic, main highway systems the country over are only about one-half complete. Instead of durable surface there is found mud, or dust, or sand. Only about 5 per cent of America's rural roads are well paved.

Highway building, like highway maintenance, is a continuous activity. Convenience, comfort, economy demand the perpetuation of this policy; and there is another consideration—traffic safety. Congested roads are subject to accidents. Moreover, one phase of boulevard making that must receive a large measure of attention henceforth is grade separation.—*Pasadena Star News.*

3,500,000 Acre-feet of Water Storage in South Coastal Basin

THE release is announced of Bulletin No. 45, "Geology and Ground Water Storage Capacity of Valley Fill," issued by the Division of Water Resources. This bulletin is one of a series on the hydrology of South Coastal Basin and is the result of about three years field and laboratory work, the laboratory being maintained at Pomona College through courtesy of that institution. The bulletin is by Rollin Eckis under the general direction of Deputy State Engineer Harold Conkling.

A major feature of the investigation has been a determination of the drainable voids in the valley fill. In the bulletin is a map showing contours of equal voids in the entire area and a tabulation showing the estimated water in storage below the water table of January, 1933.

THIRTY-FIVE BASINS STUDIED

South Coastal Basin divides into 35 basins, which were separately studied. It is estimated that in the next 50 feet below the before mentioned water table there are 3,500,000 acre-feet of water.

It is found that void space in alluvium as it occurs in South Coastal Basin is smaller than generally supposed. In some basins the void space is only about 5 per cent, while the maximum basin is about 12 per cent. Most basins run from 7 per cent to 10 per cent.

Problems connected with water rights and water supply in South Coastal Basin encounter difficulties in their solution because a great deal of the information is underground.

DEPENDS ON DRAINABLE VOIDS

A very important matter is to determine how rapidly are the water resources of the various basins being depleted. The easiest method for such an estimate is to calculate the change in underground storage from year to year. This depends on the drainable voids in the underground material.

A change of five feet in the water table may represent a much greater change in storage in one basin than in another because the drainable void space differs between the two basins.

MOTOR VEHICLE DEATHS INCREASE

A 15 per cent increase in motor vehicle fatalities—the largest in a single year in the history of the State—was reported for 1934 by the California Highway Patrol.

J. F. Craemer Brings Wide Experience to New Office of Assistant Director

JUSTUS F. CRAEMER, recently named Assistant Director of Public Works, with headquarters at Los Angeles, entered upon his new duties not only with an extensive knowledge of the State highway system but with a rather impressive record of public service in general.

As a newspaper man, with an intense interest in public affairs, he had the opportunity, over many years, of contact with State officials and a close-up view of the problems of State government.

From the inception of the State highway system, he was an active supporter of expansion adequate to the needs of the State. Recognizing the economic and social importance of a system of good roads, he gradually became familiar with the engineering and administrative problems of the highway department, so that when he came to occupy an official position in the organization he was by no means strange to the duties of the office.

BROAD RANGE OF ACTIVITIES

His equipment for an administrative office was, however, considerably beyond anything suggested by a thorough study of highway problems. Public service had occupied a large part of his time and energy for many years. A newspaper publisher and orange grower of Orange, California, he nevertheless found time for a surprising range of other activities.

As a former member of the board of directors of the State Agricultural Society, he was actively concerned with the management of the State Fair for a period of years. He is credited with having conceived and promoted the Western States Exposition which featured the State Fair at its diamond jubilee celebration in which five western States and the Republic of Mexico participated.

LEADER IN NEWSPAPER WORLD

In newspaper activities he has taken a conspicuous part for many years. His capacity for organization has won him frequent recognition in press circles as a result of which he has served in the presidency of the National Editorial Association and the California Newspaper Publishers Association,

JUSTUS F. CRAEMER

having been one of the organizers of the latter body. His activities contributed much toward bringing the National Editorial Convention to California in 1926 and again in 1932. He has been vice president of the California Press Association for many years.

The State Chamber of Commerce also provided him with a field of activity in which he served as a member of the board of directors and as chairman of the Southern California Council.

RESIGNED AS SECRETARY

Last year, at the beginning of the campaign for the governorship, he became private secretary to Governor Merriam and performed the onerous duties of that position during the primary and general election campaigns. He resigned that post in December of last year. He has been assigned by Director Earl Lee Kelly to Los Angeles where he will be in close touch with the ever growing needs of southern California.

By means of the large number of relief employment laborers assigned to irrigation districts throughout the State, much necessary maintenance work, heretofore deferred for lack of funds, has been done. This work has included rebuilding of structures and enlargement of canals, and has put the systems generally in excellent shape for the 1935 season.

Information from all parts of the State indicates that most districts which depend for irrigation upon direct diversion of natural flow from streams will be well supplied with water for the 1935 season, and that a full season's irrigation is assured in those districts having storage reservoirs.

DISTRICTS SECURITIES COMMISSION

An order has been issued by the Commission validating refunding bonds of the Palmdale Irrigation District. The principal amount of the bonds validated is $222,500 which by agreement with the bondholders is to be exchanged for the entire $445,000 of district bonds now outstanding.

Orders of approval were issued by the Commission as follows:

1. Beaumont Irrigation District—For an issue of refunding bonds in the amount of $159,000 to secure a loan from RFC. With this loan the district is to retire its outstanding bonds amounting to $205,100.

2. Merced Irrigation District—For an issue of refunding bonds in the amount of $8,600,000 to secure a loan from RFC with which to retire its outstanding bonds of $16,190,000. Also order approving plan of readjustment under the Federal Bankruptcy Act.

3. Santa Fe Irrigation District—For an issue of refunding bonds in the amount of $394,500 to secure an RFC loan with which to retire its outstanding bonds of $686,000.

4. Lindsay Strathmore Irrigation District—For the expenditure of $6,500.

5. Oakdale Irrigation District—For the expenditure of $13,624.56.

FLOOD CONTROL AND RECLAMATION

SERA Relief Work.

The SERA relief projects under the direction of this Division continued the work of clearing flood channels. During the period January 23d to February 16th, a total of 46,975 man-hours was worked. Except in the Tisdale and Sutter By-passes, where no work was done during the period, the weather interfered very little with the work. The total man-hours of relief labor worked to date are as follows:

	Man-hours
Federal Transient Service, Upper Sutter By-pass	6,278
Federal Transient Service, Tisdale By-pass	2,989
Federal Transient Service, Lower Sutter By-pass	15,490
SERA Project No. 35-B14-27, American River	59,815
SERA Project No. 58-B14-15, Feather River north of Marysville	50,347
SERA Project No. 58-B13-35, Feather River south of Marysville	28,356
SERA Project No. 57-B14-4, Sacramento By-pass	9,472
SERA Project No. 35-B14-222, leveling spoil bank, American River	4,658
SERA Project No. 51-B-13-10, Bear River	778
Federal Transient Service, seepage canal	630
SERA Project No. 35-B14-40, Mokelumne River	7,376
Total	186,189

An SERA Project, No. 51-B13-10, has been sponsored by Reclamation District No. 1001, for clearing the overflow channel of the Bear River, and this Division is cooperating in the work to the extent of furnishing supervision, use of tools, and truck. The foreman and truck driver are furnished by us, but are paid by District No. 1001. This project provides for the use of 22,000 man-hours of relief labor, and work was commenced on February 12, 1935. Several other additional projects have been applied for, one of which has been approved, involving clearing work in the Butte Slough By-pass. This work will be commenced as soon as additional men are available, or upon completion of some of the other projects.

DAMS

Applications were approved for the construction of the Guadalupe dam of the Santa Clara Valley Water Conservation District on February 18th; the Mad River Dam of the City of Eureka on February 11th and the Mount Stoneman dam of the Folsom State Prison on February 5, 1935.

Application for the repair of Phoenix Reservoir of the Pacific Gas and Electric Company was approved on January 21, 1935.

The construction of the big Canyon Creek dam in

Engineers Studying Location Plans for Proposed Coyote Dam

(Continued from preceding page)

El Dorado County has been completed and an order authorizing use has been issued. The enlargement of the Lake Orinda Dam is completed. Authorization for use of the El Capitan Dam of the City of San Diego was issued on February 4, 1935. Repairs on the Antioch Dam are practically completed. Work on the Calero Dam of the Santa Clara Valley Water Conservation District is under way.

Progress is being made by this office in conjunction with a Consulting Board appointed by the State Engineer consisting of Dr. Geo. D. Louderback, Consulting Geologist; F. C. Herrmann and J. D. Galloway, Consulting Engineers, in investigating the site and review of the plans for the Coyote Dam of the Santa Clara Valley Water Conservation District.

Work is progressing on the timber facing on San Gabriel No. 2 Dam of the Los Angeles County Flood Control District and work on the San Gabriel No. 1 Dam is confined to the excavation of the cut-off trench.

Inspections during the past month revealed the fact that due to the heavy rains many of the reservoirs are either full or filling rapidly, some dams being observed under full load for the first time.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The flow of the Sacramento River at Sacramento remained at about 20,000 second-feet in early February with an increase to about 35,000 second-feet in the middle of the month. On February 10th there were no samples from delta stations showing salinity greater than 9 parts of chlorine per 100,000 and at Bullshead Point at the lower end of Suisun Bay the salinity had dropped to 140 parts.

WATER RIGHTS

Supervision of Appropriation of Water.

During the month of January 23 applications to appropriate water were received, 26 were denied and 17 were approved. In the same period 10 permits were revoked and 5 passed to license.

Among the more important applications received were two to appropriate from San Luis Rey River in San Diego County for municipal purposes; one by Carlsbad Mutual Water Company and the other by the City of Oceanside.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

The final sheets covering the Pentland and West of Tejon Hills Quadrangles in Kern County are now available and can be obtained at a cost of 10 cents each. These sheets were surveyed by the topographic branch of the U. S. Geological Survey in cooperation with the Division of Water Resources.

California Woman Suggests Need of a Highway Pledge

AMONG the letters recently received by Director Earl Lee Kelly, was one from Mrs. Queen Walker Boardman, a member of the Women's Community Service Auxiliary Committee of the Los Angeles Chamber of Commerce submitting a highway pledge and enclosing a copy of a letter to Governor Frank F. Merriam in which she urges its adoption as the "Offifficial State Highway Pledge."

Mrs. Boardman wrote the Governor as follows:

March 8, 1935.

Governor Frank F. Merriam,
Sacramento,
California.

Dear Governor Merriam:

January 1st I resigned from all active committee work because of ill health. This does not mean I am no longer interested.

During my term as Chairman of Roadside Beauty for the Women's Auxiliary of Los Angeles Chamber of Commerce, I wrote the enclosed Highway Pledge. I am most anxious to see it become the Official State Highway pledge. Several States have adopted pledges.

I am writing Mr. John Austin and Mr. Earl Lee Kelly, seeking their support.

Thanking you for your cooperation and with good wishes,

Sincerely,

Queen Walker Boardman.

The pledge submitted by Mrs. Boardman reads as follows:

HIGHWAY PLEDGE

I pledge devotion to the Highways of our Country, to the preservation of their existing natural beauty and to the intelligent development thereof; that our highways may serve not only as arteries of the nation's commerce, but through their beauty bring peace and joy to those who travel them in their hours of leisure.

The Pentland sheet covers an area in the vicinity of Pentland and is done on a scale of 1:31,680 with a contour interval of 5 feet.

The West of Tejon Hills Quadrangle covers an area in the vicinity of Wheeler Ridge. It likewise is a cooperative sheet done on a scale of 1:31,680 with a contour interval of 5 feet.

New District X Office Building in City of Stockton is Formally Opened

THE NEW highway office building of District X in Stockton was formally opened on Thursday, February 28th, and the occasion was celebrated with a dinner given by District Engineer R. E. Pierce and staff to official guests at the Hotel Clark, followed by a dedicatory meeting and reception in the new building.

The dinner was attended by Director of Public Works Earl Lee Kelly; State Highway Engineer C. H. Purcell; Assistant State Highway Engineer G. T. McCoy; Chairman Harry A. Hopkins of the Highway Commission and Commisisoners Timothy A. Reardon and Frank A. Tetley; Deputy Director of Public Works Edward J. Neron; State Architect G. B. McGougall and a large delegation of other members of headquarters' staff at Sacramento as well as District Engineers C. H. Whitmore from Marysville, R. M. Gillis from Fresno and L. H. Gibson of San Luis Obispo.

MEETING HELD IN BASEMENT

Despite a very inclement night several hundred folks gathered at the new headquarters to inspect the building and attend the meeting held in the spacious basement.

District Engineer Pierce opened the meeting with an address of welcome and introduced the group at the speakers' table which included Messrs. Kelly, Purcell, Hopkins, Neron, Reardon, Tetley, McCoy, Mayor Con. Frank of Stockton, Senator George M. Biggar of Covelo, and John Blake of Lodi, highway committee chairman, Central Valley Council, State Chamber of Commerce.

Other speakers during the evening included Senator Bradford S. Crittenden of Stockton, Superior Judge J. J. Trabucco of Mariposa County, Alexander Ross of Amador County and William Cox of Stanislaus County.

CALIFORNIA-SPANISH DESIGN

The new building, located at the northeast corner of Center and Rose streets is a reinforced concrete one story structure with a tile roof in the California-Spanish style. The basement extends under the entire building. There are eleven rooms in the building in addition to a public lobby, information room and stock room.

The heating is adequately cared for by a gas steam furnace, the smaller rooms with radiators, the larger rooms with radiators and forced draft for better distribution of heat.

For the hot weather season there is a water cooled air ventilating system, reaching all parts of the structure.

The building is on a lot approximately 150 feet square, which is one quarter of a city block.

The structure is 121 feet by 82 feet, leaving a parking area for employees' cars in the rear of the building, which will be graveled and surfaced.

ADEQUATELY PLANNED STRUCTURE

Since the district headquarters was moved from Sacramento to Stockton, a year and a half ago by Director Earl Lee Kelly, temporary quarters have been occupied in a local office building.

"This new building," said District Engineer Pierce, "makes the fifth place in which District X has done business since its formation in 1924, and it is the only one properly planned to adequately care for our various activities for which I wish to express my appreciation to State Architect McDougall and his staff.

"We feel that we are now definitely established and know that our employees are well taken care of in this splendid new structure."

In further celebration of the opening of the new district headquarters, the Stockton Rotary Club of which District Engineer Pierce is a member held their regular noon luncheon on March 6th in the basement of the building.

LICENSE FEE REVENUES SHOW GAIN OF $341,331 OVER 1933

The Department of Motor Vehicles on February 8 cut a huge melon valued at $5,444,198, representing that portion of license fees collected for the year 1934, which is apportioned equally between the Department of Public Works and the various counties.

Registrar Russell Bevans announced the apportionment is based upon fee-paid registrations for the year totaling 2,080,884. The sum apportioned is $341,331 in excess of the apportionment of 1933 while fee paid registrations showed a gain of 43,966.

NEW DISTRICT HEADQUARTERS BUILDING in Stockton is a one story reinforced concrete structure 121 x 82 feet located at Center and Rose Streets. It has 11 office rooms in addition to a public lobby, information room, stock room and basement.

THE SPEAKER'S GROUP at the formal opening of the new building included (left to right) Highway Commissioner T. A. Reardon; Assistant State Highway Engineer, G. T. McCoy; Chairman H. A. Hopkins of the Highway Commission; State Highway Engineer C. H. Purcell; Director of Public Works Earl Lee Kelly; John Blake of State Chamber of Commerce; District Engineer R. E. Pierce; Con. J. Franke, Mayor of Stockton; Senator G. M. Biggar; Highway Commissioner Frank A. Tetley and Deputy Director of Public Works Edward J. Neron.

California Engineer Finds Germany Building 5000 Miles Express Highway

Ernest Zube, Junior Physical Testing Engineer with the Materials and Research Department of the California Division of Highways, took a leave of absence during the summer of 1934 to visit his aged parents in Germany. While on the trip, Mr. Zube took note of German road building and laboratory practice. The results of his observations are set forth in the following article. Special attention is called to the importance which the German road building agencies attach to laboratory studies and tests.

By **ERNEST ZUBE,** Junior Physical Testing Engineer

WHILE on a visit to Germany during the past year, I was afforded the opportunity of making some interesting observations regarding the road building and testing methods employed by that country. A number of highway laboratories were visited during the trip. With the hope that these observations may be of interest to those who work or ride on California highways, the following brief outline of the highway situation in Germany and notes on the various laboratories is given.

Germany, in area a little larger than California, with a population of about 65,000,000, has approximately 140,000 miles of highways. These highways in former years consisted mostly of water-bound macadam or some type of stone pavement. The ever-increasing automobile travel has made it imperative that these old roads be improved with some sort of smooth, wear-resistant surface. Consequently, the problem within the last few years has been one of improving and maintaining these roads, rather than one of new construction.

LIGHT SURFACE TREATMENT

A thin bituminous surface course placed over the well compacted macadam roads generally gives excellent results, and in some instances this wearing course in only about one inch in thickness. Penetration methods, emulsions and sheet asphalt (for city streets) are used extensively. Due to the fact that bituminous surfaces are still three to four times as expensive as in the United States, the improvements could not be carried out as might be desired and a light surface treatment is frequently the best that can be afforded.

Germany has no natural gas, and is compelled to manufacture its gas from the destructive distillation of coal, and therefore coal tar, a by-product, is widely used for paving purposes. However, due to its tendency to become hard and brittle with age, this material is not considered as desirable as asphalt. Quite often the bituminous binder consists of a mixture of tar and asphalt.

Gasoline and tires are still quite expensive in Germany, and in order to stimulate further automobile travel, the government now has under construction a system of express highways, which are to serve as the main arteries between the larger cities. An important part of this plan is the policy of avoiding the close-together, congested communities.

BUILDING EXPRESS HIGHWAYS

At present, the building of these express highways (Autobahnen) is the most important work in German highway construction. The first unit (now under way) consists of approximately 5000 miles, of which about 1000 miles are finished. Hand labor is employed whenever feasible for the purpose of decreasing unemployment.

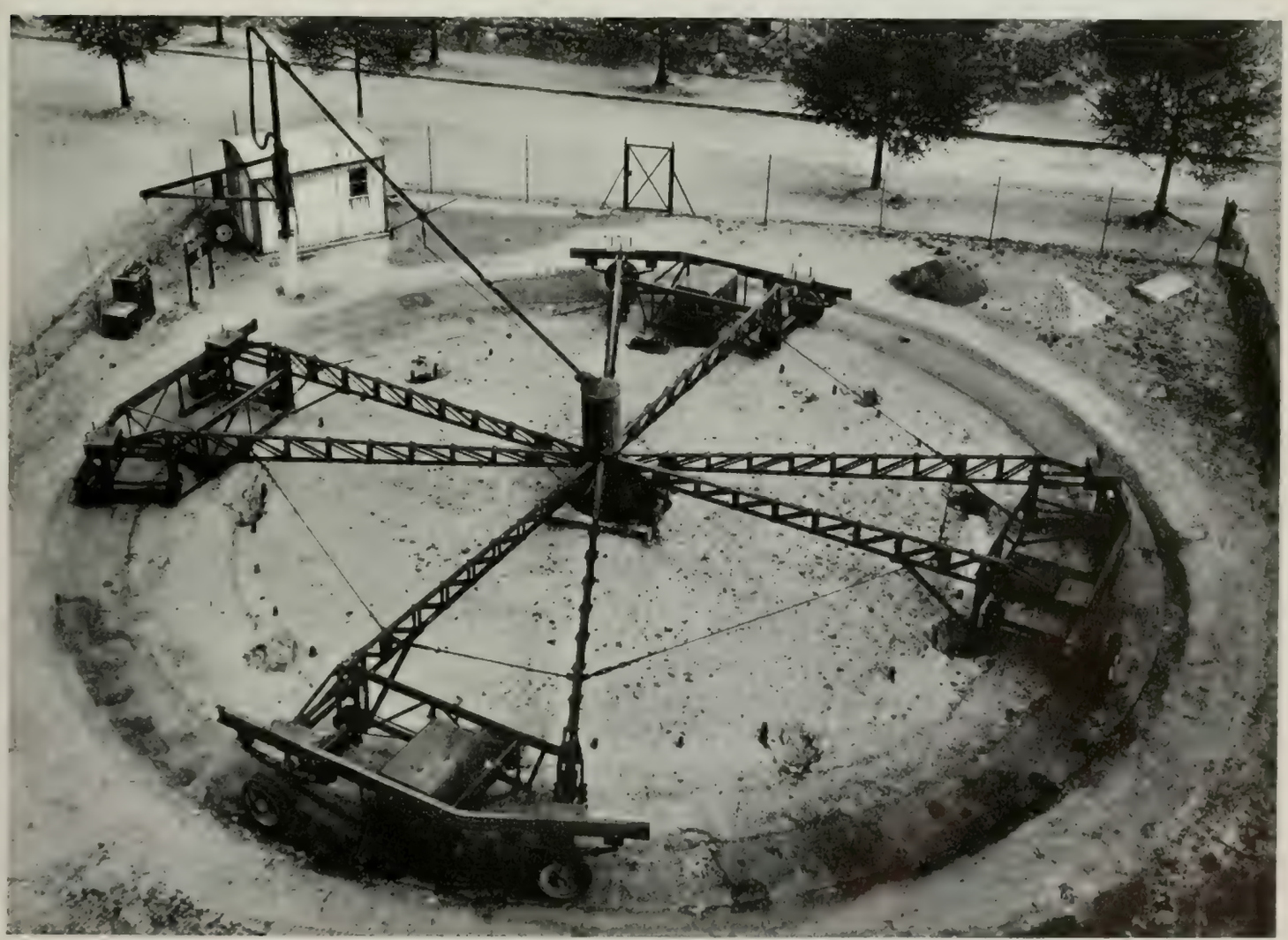
After the completion of this construction program, a large increase in automobile travel is expected, and it may be of interest to note that the total automobile registration in Germany in 1933 was double that shown in 1932 and 1934 shows a further substantial increase.

The new auto roads are being built for high speeds and the curves are designed for speeds up to 120 miles per hour. The typical cross-section shows a center lawn strip, 15 feet wide, with a pavement 25 feet wide, consisting of two traffic lanes on either side, bordered by shoulders.

These roads are being beautified by planting trees and shrubbery on the center strip and along the edges of the shoulders, species

(Continued on page 28)

GERMAN EXPRESS HIGHWAY under construction. This typical section provides for a center lawn strip 15 feet wide, with a pavement 25 feet wide, consisting of two traffic lanes on either side bordered by shoulders. Note the planting of trees and shrubbery on center strip.



ELABORATE TEST TRACKS equipped for the testing of road materials under conditions comparable to actual traffic are used by German highway laboratories. The track is about 70 feet in diameter, permitting a test road of from 6 to 10 feet wide. A side movement of the apparatus permits the wheels to cover the entire surface.

German Laboratories Using Test Tracks

(Continued from page 26)

being selected that reflect light readily from the autos. The shrubbery on the center strip also tends to protect the driver from the glaring headlights of cars traveling in the opposite direction.

The pavement consists of either bituminous surfaces or Portland cement concrete. Due to frost action in the winter, great care is taken with the construction of the subgrade. A cross-section of one of these concrete roads consists of approximately 3 to 4 inches of gravel spread upon the subgrade, 5 inches of rather porous lean concrete, a six-inch course of a little better grade of concrete, followed by a 3-inch surface course, with a wire mesh between the last two courses. The bituminous surfaces are constructed either on a lean Portland cement concrete base or on a Telford base, and are designed according to the void theory, attempting to produce a minimum of voids (2%–4%).

The express highways will be absolutely free from grade crossings and intersections —viaducts or subways being provided to permit a continuous fast and safe travel. Elaborate systems are worked out for the crossing of highways (braided intersections) to permit the transfer of a machine from one highway to another. The roads will also be illuminated, and experiments are being carried on at present with five different systems of lighting.

The pavement in the smaller cities still consists mostly of some type of stone pavement; in fact, a modern pavement within these century-old surroundings might be somewhat incongruous. In the larger cities and suburbs, where a considerable amount of horse drawn vehicles are still encountered, sheet asphalt or asphaltic concrete, with a maximum aggregate up to $\frac{3}{8}''$, is constructed. A close, dense wearing course is necessary to prevent any damage caused by the digging action of the horses' hoofs.

Several special processes, such as rolling with corrugated rollers, etc., are used to prevent slippery surfaces on sheet asphalt. Stone pavement, consisting of small hewn granite blocks, 2 to 3 inches square, laid in arch shaped courses, is also used a great deal. This presents a smooth, nonskid and satisfactory pavement for motor vehicle traffic.

TREE-LINED ROADS

Almost without exception all existing roads are lined with trees, and roughly split rocks, painted white, about 16 inches high, are set along the edges of the shoulders for guidance.

The chief means of transportation in Germany is still the government owned railroad, which in a spider web fashion covers the entire country; and the railroad station in the larger cities is an important and frequently a pretentious building. The resulting numerous grade crossings and the large number of daily trains make it necessary to have crossings protected by gates tended by gatemen.

While traveling in Germany, one is impressed with the multitude of bicycles, which, ridden by all types of people, frequently present a rather amusing sight, at least to a stranger. The traffic officer in directing traffic considers bicycles on a par with automobiles. Some highways include a separate strip for bicycle traveling.

TEST TRACKS FOR MATERIALS

The materials intended for road building purposes are investigated very thoroughly and subjected to a good many tests. Quite often the proposed method and material is tried out in test tracks which duplicate actual conditions. The slogan seems to be "**Foresight is better than aftersight.**"

Besides the government testing laboratory at Berlin, there are at least a dozen university laboratories, with highly trained personnel, entrusted with the testing of road building materials. In addition to the routine testing of samples, extensive research programs are carried on by the laboratories.

My itinerary in Germany took me through Bremen, with its old city hall, built almost a hundred years before the discovery of America, up the historic Rhine to the University of Karlsruhe. The laboratory, directed by Professor Dr. Raab, is equipped with quite an elaborate test track for the testing of road materials under conditions comparable to actual traffic. The track is about 70 feet in diameter, permitting a test road of from 6 to 10 feet wide; a side movement permits the wheels to cover the entire surface.

Next the university laboratory of Stuttgart, which is under the direction of Professor Dr. Neumann, was visited. The Stuttgart labora-

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Stanton Making Brave Fight for Recovery from Severe Illness

Philip A. Stanton, member of the California Highway Commission and former Speaker of the Assembly has been making a long, brave fight against a serious illness that afflicted him just before Thanksgiving and has kept him confined to bed in his home in Anaheim.

He has passed through several critical periods when the doctors feared his heart would be unable to stand the great strain but his indomitable will pulled him through on each occasion.

As he entered the third month of his illness his condition improved and recently he has been able to sit up and receive short visits from his intimate friends who are hopeful of his ultimate recovery.

Commissioner Stanton has always taken a keen interest in the State highway system and during his service in the Legislature gave valuable aid in the early efforts to organize a department that has put California in the front rank of highway development in the nation.

He has taken a most active part in the work of the Highway Commission and until his illness rarely missed a meeting.

PHILIP A. STANTON

AUTOMATIC RADIO BROADCASTS FLOOD WARNINGS

(Continued from page 12)

second intervals (easy to count), then a pause, then four dashes, then a pause, and then two dashes. The call letters of the station are also automatically "keyed." The keying device is operated by a weight-driven clock and by a float on the water surface in the gage well. This apparatus also is equipped with time switches which "turn on and off" the radio transmitter at any desired predetermined intervals.

The radio transmitter is a simple quartz crystal controlled oscillator using dry batteries entirely for both the filament and plate circuits. The signal is, in radio parlance, known as an i.c.w. signal (interrupted continuous wave) which can be received by any oscillating receiver covering the particular transmission frequency. Signals have been received satisfactorily at distances as great as 300 miles.

Through cooperation with the United States Geological Survey four transmitting channels have been allocated to this new type of service with the call letters of KIDD. In most instances installations have been made in standard U. S. G. S. gage houses at remote points where there is otherwise no medium of satisfactory communication. District Engineer H. D. McGlashan of the U. S. G. S. in San Francisco is cooperating with the State Engineer's office.

GRADE CROSSING FATALITIES SHOW A SLIGHT DECREASE

Eight fewer people were killed in crossing accidents in California in 1934 than in 1933, the report of the Railroad Commission shows. But at that, 161 more people than should have been so killed were listed as crossing fatality victims, that figure being the 1934 total of such deaths.

The improved showing of last year, slight as it was, is credited by the commission's transportation engineer to such increased safety measures as separated grades, wig wag signals and gates. The showing is an automatic argument in favor of further extension of those measures, particularly grade separation.—*Palo Alto Times.*

Three Feather River Bores Scheduled for Completion by 1936

(Continued from page 15)

heading. The men working on this job have to go to and from work along the railroad tracks, crossing the river in boats. It is planned to have this pioneer bore, which will be large enough to allow a shovel to be run through, completed by the time the lead shovel has worked its way to that point, or about September 1 of this year.

PRESENTS HERCULEAN TASK

All of this work is scheduled for completion in 1936. One and a third million cubic yards of solid rock excavation, 865 feet of 28′ tunnel, together with all the clearing, drainage structures, masonry retaining walls and finishing required on 12 miles of highway is a fair-sized assignment to attempt to complete within the time being allowed.

A brief summary of the work done and the costs for the first eighteen months of the present biennium might well be used to illustrate the work which is being done by these camps. Since July 1, 1933, the convict forces have built 11½ miles of road, moving 1,555,956 cubic yards of material, of which 1,400,000 cubic yards were solid rock. Five hundred forty tons of explosives were used, or 0.77 pounds per cubic yard; 415,250 lineal feet or over 78 miles of holes were drilled in rock at the rate of 60 feet per day per jack-hammer, for an average cost of 30½ cents per foot. For each foot of drilling, 3⅓ cubic yards of rock were broken, the cost of drilling amounting to 9 cents per cubic yard.

The total cost of this excavation, including a proportionate share of the camp setup and cost of supervision, has amounted to $0.53 per cubic yard. Considering the hardness of the rock and the many obstacles encountered, among which the close proximity of railroad, high voltage power lines and telegraph wires are not the least, this cost is quite reasonable.

TUNNELING THROUGH GRANITE

Work has only recently been started on the tunnels. A heading 14x9 feet has been driven at Tunnel No. 1. This work was completed early in March, and the tunnel crews are now working on the heading for Tunnel No. 3. A five-foot round was drilled and mucked each day. The hard granite appears to be ideal for a tunnel. It drills and breaks very well and stands without timbering.

SNOW FIGHTERS THANKED FOR KEEPING ROADS OPEN

Company 905
Civilian Conservation Corps
Camp Rincon F-130
Azusa, California.

January 27, 1935

Highway Department,
State of California,
Los Angeles, California.

Gentlemen:

The commissioned personnel and the enrolled personnel of this company truly appreciate the work that Foreman Charles Ward has been doing this winter in regard to keeping the San Gabriel Highway open, during and after the many rains which caused numerous land-slides on the road. Because of Mr. Ward's efforts, this company has been able to get through and get its supplies without interruption or delay and the over 200 members of this company do appreciate his efforts.

Yours truly,

(Signed) GEO. A. ANDERSON,
1st Lt. Air-Res., Commanding.

Tahoe City, California.
January 24, 1935.

Mr. C. H. Weeks,
Maintenance Sup't.,
Division of Highways,
Truckee, California.

Dear Mr. Weeks:

I wish to thank you for your courtesy in opening the road to the school. The P. T. A. held a meeting today, and the members all expressed their appreciation. Also, not only do we enjoy the convenience of being able to use cars, but we feel secure against fire now that the hydrants are available and the fire apparatus accessible.

With deepest gratitude, I remain

Sincerely yours,

(Signed) BLISS McGLASHAN HINKLE.

In order to maintain the scheduled rate of progress in these two convict camps in view of the harder rock encountered, there are now in operation thirteen air compressors having a total rated capacity of 4065 cubic feet of air per minute. These operate 35 jack-hammers on the grade and four drifters in the tunnel headings. Other equipment in daily use in these camps consists of 24 four-yard dump trucks, several 50 and 30 h.p. Diesel tractors with bulldozers, scrapers and graders.

At Camp No. 30, Ed Rawson is Superintendent, and G. M. Webb is Resident Engineer. At Camp No. 28, W. B. Stout is Superintendent, and R. E. Ward is Resident Engineer.

Pavement Experiments Made in Berlin

(Continued from page 28)

tory also has a circular test track available for testing purposes, and a number of research investigations, such as influence of filler material, adsorptive qualities of aggregate, colloidal composition of asphalts, determination of friction between different types of pavement, and many others, are conducted. Dr. Neumann visited our California State Laboratory in 1930, and is a staunch advocate of employing California construction methods in Germany.

My next stop was Munich, where in connection with the International Road Congress of 1934 an exhibit, "The Street" ("Die Strasse") was held. The evolution of roads, beginning with an excavated portion of an old Germanic plank road built about 1000 B. C., and examples of various periods up to the present were shown in pictures, graphs and models.

To me, one of the most interesting parts of the exhibit was the one entitled: "Testing and Investigation of Road Building Materials." All types of apparatus for the chemical and physical testing of materials, together with good and inferior samples of road surfaces were exhibited.

TIRE FRICTION TESTED

Considerable equipment for determining the tire friction and slab vibrations of different pavements was shown, together with the test results. A special section dealt with the investigation of soils. A number of laboratories had exhibits of apparatus, and with the aid of pictures and charts demonstrated to the engineer and layman the importance of the subsoil in the construction of highways.

Also very interesting was an electrically operated model showing the different proposed lighting systems for the new express highways. By pressing a button, one can view in sequence the illumination of the road by daylight, then in the slowly approaching darkness the illumination by automobile headlights, followed by the various contemplated stationary lighting systems.

A visit was next made to the laboratory of the University of Dresden, which is under the direction of Professor Geissler. Here investigations relating to the cohesive qualities of asphalt, fineness of filler materials, and an extensive experiment on the breakdown values of emulsions were being conducted.

In Berlin three laboratories were visited. One, the laboratory of the University, directed by Professor Dr. Schenk, has been conducting comprehensive experiments for determining the resistance offered to skidding by different types of pavement; an investigation of the possibilities of impregnated wooden blocks for base courses was in progress. A circular and a straight test track were part of the facilities of this laboratory.

The laboratory of the city of Berlin, under the direction of Dr. Herrmann, has control of the city pavement design. Berlin's bituminous surfaces consist mostly of sheet asphalt or a fine asphaltic concrete mixture, similar to our Type "C" surface, and were in excellent condition.

A test being conducted on a sample of asphaltic concrete, similar to our Type "A," containing 10 per cent filler, 5.1 per cent asphalt, gave at room temperature a compression value of 800 pounds and a tension of 350 pounds per square inch. The laboratory makes extensive use of a sandblast to predetermine the wearing qualities of bituminous and cement concrete surfaces.

The State Soil Laboratory in Berlin, with Baurat Ehrenberg in charge, was an excellently aquipped institution. Soil investigations, not only for road building but also for bridges, dams, etc., are carried on.

EXHAUSTIVE TESTS AT UNIVERSITY

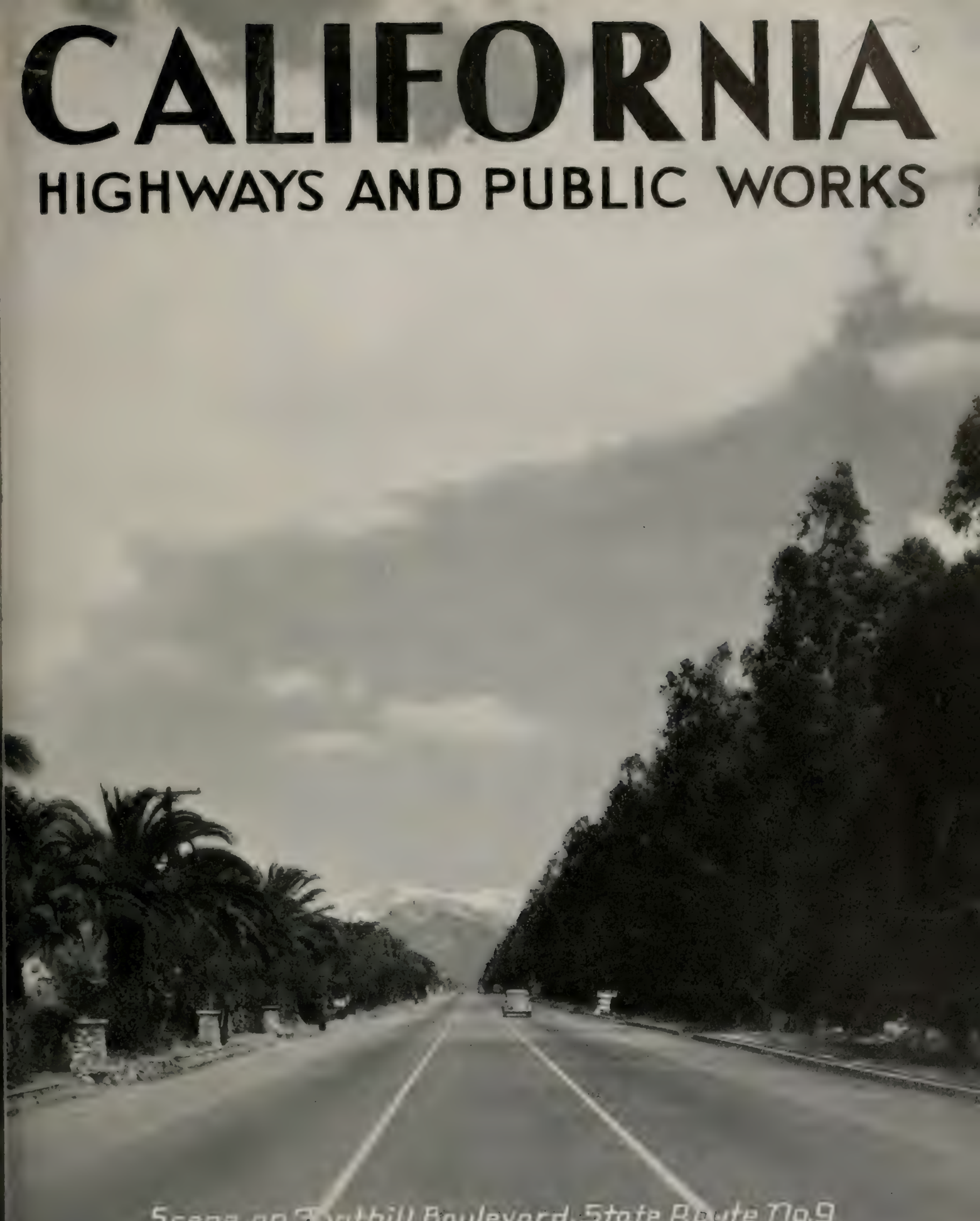
The last place visited was the university laboratory of my home town, the "Free City of Danzig," under the direction of Professor Hoepfner. The testing of road building materials is performed there for the eastern section of Germany, which is separated from the rest of Germany by the Polish Corridor.

Here I familiarized myself with the routine testing, which in addition to our methods, includes special determinations such as brittle point, stiffness point and drip point for bituminous materials; also compression, tension and elongation, permeability, penetration, sand blast and abrasion for the wearing course. An investigation relating to viscosities of bituminous substances at different temperatures had been carried on.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Scene on Foothill Boulevard, State Route No. 9
near Fontana looking toward Mt. San Bernardino

Official Journal of the Department of Public Works
APRIL 1935

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Governor's Road Plan Would Have Cut Taxes $60,000,000 in Last 5 Years

Records Disclose Supervisors Spent on County Highways an Average of $12,000,000 per Year Above their Gasoline Tax and Vehicle Fee Revenues with which State Proposes to Administer Unified Systems

By **EARL LEE KELLY**, Director of Public Works

GOVERNOR Frank F. Merriam, presented a long and carefully considered message to the Legislature on the State's finances at the January session. This document in every part contained important proposals for improving the economic security and governmental efficiency of the State of California. Not the least of the proposals of Governor Merriam's message was that relating to California's highways.

Briefly and simply stated, Governor Merriam's road bill is a tax reducing measure. The Governor proposes to abolish county road taxes against real and personal property and to place the burden of county roads, as well as State highways, upon the State gasoline tax.

This means that the gasoline tax will foot the entire highway construction and maintenance cost in California.

This means that should the Governor's road bill be adopted by the Legislature, taxes against homes and farms, real estate, and personal property, estimated at more than $16,000,000 a biennium, will be saved to the taxpayers and a study of county records and the results of the recently completed California Transportation Survey shows that in putting the figure at $16,000,000 Governor Merriam was more than conservative in estimating possible savings. Will the county roads that have been maintained by these real estate common property taxes suffer in the loss of this revenue?

EARL LEE KELLY

The answer of the State Department of Public Works which, under the Governor's bill, will take over the administration of the county roads, is that they will be as well, if not better, maintained, than they are now and without any taxes other than the pennies paid as a gasoline tax.

The reason the State Department of Public Works can do this work for less money than is now spent, is that one unit can always function more effectively than many units.

Today we have in California fifty-eight counties, one of which is the consolidated city and county of San Francisco. Each of the other fifty-seven have county road departments levying taxes to maintain and build county roads. These fifty-seven road departments have duplicate machinery, duplicate overhead, and they cannot hope, with fifty-seven varieties of overhead, to function as efficiently as one specialized State Division of Highways.

We believe the time has come for all of California's roads, State highways as well as

(Continued on page 8)

Governor Merriam Formally Opens Reconstructed American River Bridge

FOR MANY YEARS the northerly entrance to Sacramento has been greatly restricted by a narrow, two-lane bridge across the American River at Sixteenth Street on U. S. Highway No. 40. In addition to carrying a daily traffic of from 12,000 to 14,000 vehicles the bridge had a 65-foot radius curve approach with a $6\frac{1}{2}$ per cent grade at the Sacramento end that made driving very dangerous and resulted in numerous bad accidents.

This bottleneck bridge, built twenty years ago, has been transformed by the State from a two-lane, 22-foot structure into a four-lane, 44-foot structure with 5-foot sidewalks on either side and wide, easy approaches, at a cost of $135,000. It was formally opened by Governor Frank F. Merriam March 24, 1935, with gala dedicatory ceremonies sponsored by the North Sacramento Post of the American Legion at which Governor Merriam and Director of Public Works Earl Lee Kelly were the principal speakers.

The ceremonies, featured by a colorful parade, were attended by a large throng of citizens and city, county and State officials and began with the playing of the National Anthem by Post 61 band, followed by a flag raising ceremony and invocation by Rev. Newton M. Moats.

SNIP GOES ANOTHER TRAFFIC BOTTLENECK as Governor Frank F. Merriam cuts the ribbon officially opening the American River bridge at Sacramento assisted by Earl A. Dart (left), master of cermonies, Director of Public Works, Earl Lee Kelly and North Sacramento Sea Scouts.

SPEAKERS ON PROGRAM

The speakers included: Commander Eric Austin, Earl A. Dart, master of ceremonies; Mayor Arthur Ferguson of Sacramento; Mayor Bert Burgess of North Sacramento;

(Continued on page 19)

AMERICAN RIVER BRDGE at Sacramento as transformed by the State Department of Public Works from a narrow, traffic bottleneck structure is pictured at top in photo by Hansaker of Bee from Barker-Witney Flying Service plane. White roadway area on upstream side indicates part added by widening operation and inset shows work under construction. Center photos show the old two-lane roadway and 65 foot radius curve approach on $6\frac{1}{2}$ per cent grade compared with the new 600 foot radius curve approach and 3 per cent grade. Bottom scene shows crowds gathering for the dedication ceremonies on March 24th, when Governor Merriam formally opened the reconstructed bridge to traffic.

Grizzly Dome Drops 75,000 Yards of Granite into Feather River Canyon

By **F. W. HASELWOOD**, District Engineer

THERE is a familiar saying that when a dog bites a man it is of no interest, but if a man bites a dog it is news.

When a river spends centuries cutting a canyon through solid rock, that is of little interest, but when the mountain towering above the river bed reverses the process and falls into the river channel, that is news—and big interesting news.

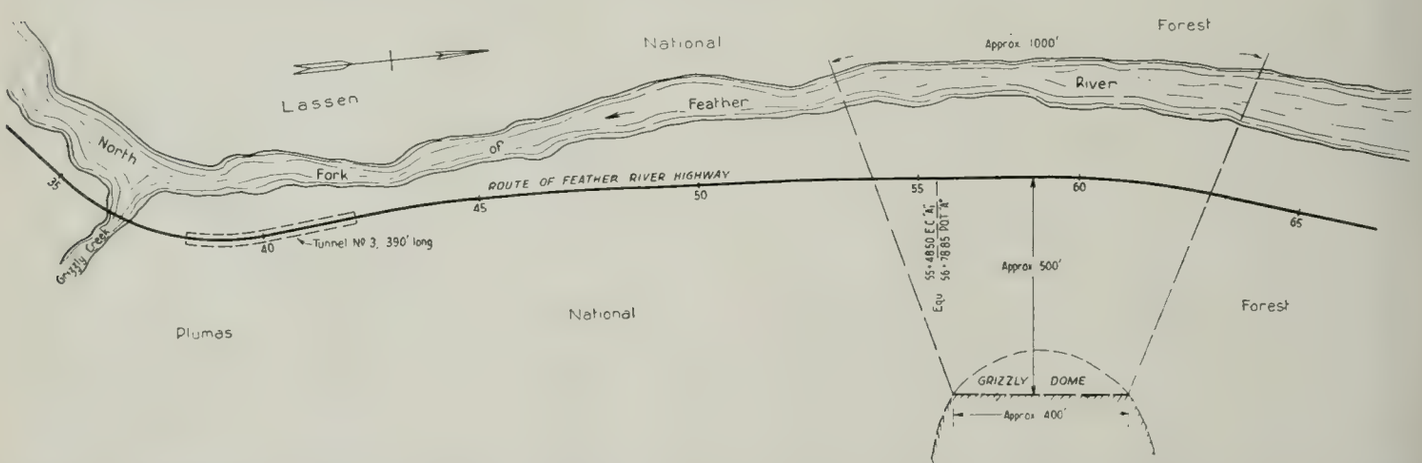
On March 26, from Grizzly Dome in Feather River Canyon some 75,000 cubic yards of rock dropped without warning into the river.

Grizzly Dome is a huge rounded and solid mass of granite rising a thousand feet above the canyon of the North Fork, that has stood, a rugged and magnificent sentinel of the Sierras through countless ages. It has seen the North Fork, through thousands of years, cut deeper and deeper through the rocky canyon at its base. During man's brief knowledge, the great dome has been taken as a matter of fact part of the scenery, a rugged fixture, always inspiring, in its massive, towering bulk as one of nature's marvels.

ALWAYS CONSIDERED STABLE

To the Division of Highways, with its plans to build a highway across the steep slope of granite some five hundred feet below the dome, and to the Pacific Gas and Electric Company, who had planed a dam in the river directly below the dome, this sudden, great slide of rock from the face of the mountain was news of vital importance.

The huge mass of solid granite rising from the river bed, with slopes ranging from forty degrees to vertical, had always been considered as stable as the rock of ages. The dome-shaped formation from which the name originated towers one thousand feet above the stream. No apprehension was felt as to the safety of the proposal to construct a highway by cutting a notch in the solid face of the slope far below the dome, and no work had been done on that section but two major movements of rock occurred when a part of the dome broke off and crashed into the river below.



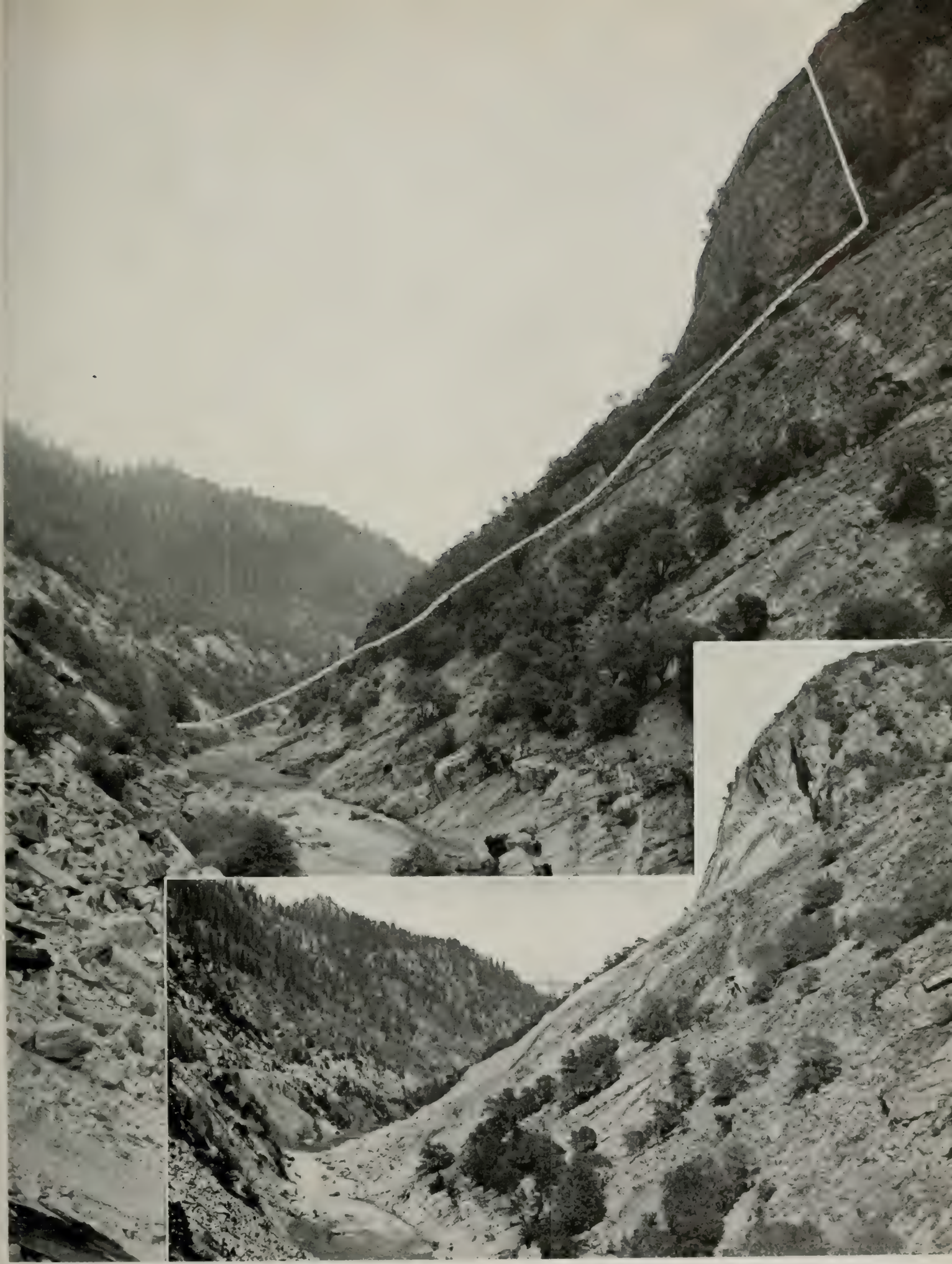
SKETCH SHOWS location of Grizzly Dome relative to proposed highway route and fan area of slide.

The vertical, broken face of the dome that remains is over five hundred sixty feet wide at its base and two hundred ninety three feet high and has an area of more than two acres. The huge mass broke into fragments as it fell, and spread in a fan shape until it reached the river.

At its crossing of the highway survey, one hundred twenty feet above the river, the breadth of the area swept clean by the falling rock was eight hundred feet wide. The North Fork channel was filled for a length of eight hundred feet to a depth that raised the water level thirty feet. The amount of rock that fell from the dome is estimated at approximately 75,000 cubic yards.

The broken face of the dome shows several

(Continued on page 28)



MOUNTAIN BREAKS AND PRODUCES A DAM—The large picture shows Grizzly Dome a mountain of solid granite as it looked before it suddenly dropped 75,000 cubic yards of its face into the North Fork of the Feather River along the line of the proposed State Highway. The debris dammed the river to a height of 30 feet drying up the stream temporarily and producing white rapids when the water rose over the dam. The lower photo shows where the large piece of the dome fell away and the resultant change in the scenery.

16 Roadside Planting and Landscaping Projects on State Highways for 1935

By **H. DANA BOWERS**, Landscape Engineer

SIXTEEN roadside development projects financed from Federal aid funds are being rushed for this year's planting throughout the State. Federal requirements that ½ of 1 per cent of California's apportionment of United States highway funds be expended on beautification have presented the opportunity to carry out many development plans that have been pending for some time due to lack of funds.

The allocation of Federal funds, combined with the use of part-time labor, has speeded up the progress of roadside development in California by leaps and bounds. Projects ranging from the planting of trees in the desert to the construction of typical architectural features at city entrances are included on the program and vary in cost from the nominal sum of $200 to as much as $30,000.

MUCH DONE LAST YEAR

In addition to the 1935 planting program, approximately $190,000 was expended in 1934 on roadside improvement, such as slope rounding, construction of rubble masonry walls, cleaning up roadsides through forest areas, development of scenic viewpoints, and many other worthwhile items that are important in themselves but are perhaps less noticeable to the motorist than the items on this year's program will be. The projects for 1934 include:

1. **SACRAMENTO COUNTY**—Planting trees and shrubbery, including installation of water line, to improve the north entrance to Sacramento on U. S. 40 from North Sacramento to Ben Ali.
2. **SACRAMENTO COUNTY**—Planting to frame the approaches to the American River Bridge, also on U. S. 40.

SCREENS OF GREENERY

3. **YOLO COUNTY**—Construction of curbs and sidewalks, installation of water lines, well and pump for water supply, and an intensified planting of trees and shrubbery to screen out unsightly areas along the west entrance to Sacramento over the new M Street Bridge on U. S. 40.
4. **SACRAMENTO COUNTY**—The landscaping of the McConnell Subway south of Sacramento on U. S. 99.
5. **SANTA BARBARA COUNTY**—An intensified landscape treatment of the new Truck Boulevard from the west city limits of Santa Barbara to Montecito. Trees and shrubs in groups will be planted the length of the entire route to screen the railroad. Water lines to facilitate maintenance are included.

PAYS DIVIDENDS

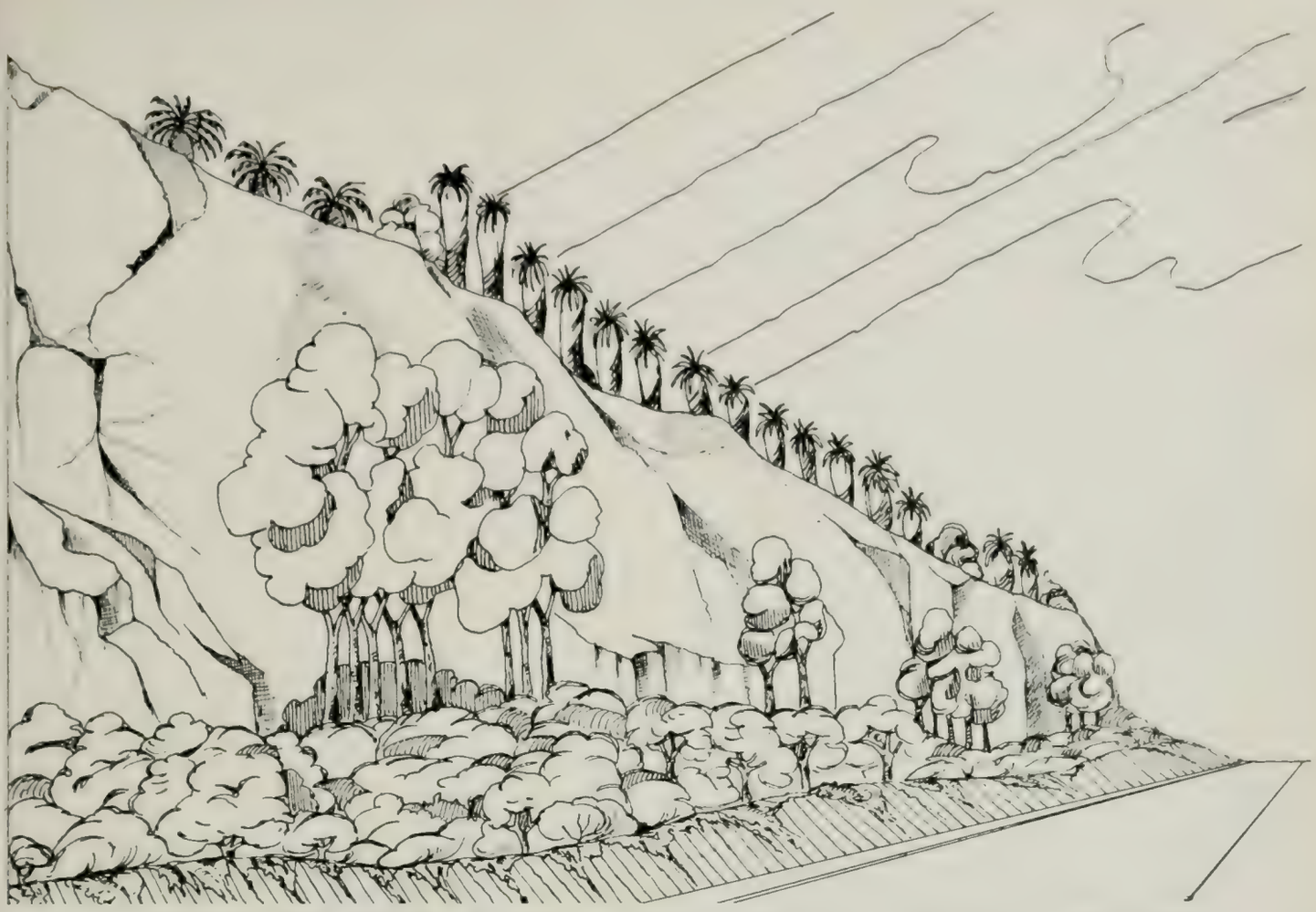
Cut slopes that tend to erode so severely in that section are to be terraced and planted to ground covers and hardy native shrubs. **The initial cost of this type of work is high, but it pays large dividends from a maintenance point of view as it eliminates erosion.**

6. **SANTA BARBARA COUNTY**—From the west city limits to Hollister Avenue, west of Santa Barbara City. A naturalistic planting will be adopted here that will harmonize with the surrounding terrain. Ground covers will be planted to eliminate fire hazard and to eradicate weed growth.

A SLOPE EXPERIMENT

7. **SANTA BARBARA COUNTY**—In Solomon Canyon south of Santa Maria. A worthwhile experiment is under way to determine the best method of treating sand slopes. It is proposed to widen the section to its ultimate width and flatten the slopes back to 2 to 1. A covering of top soil will be placed over the sand and indigenous native shrubbery will be planted.

   The outcome of this project will decide more or less the future treatment of that section when it becomes necessary to widen the road to accommodate future traffic increase.



TYPE OF TREATMENT ALONG SANTA MONICA BLUFFS

8. **SAN BENITO COUNTY**—At the intersection of the Prunedale Cutoff and the new Rocks Road entering San Juan Bautista.

A most unusual type of roadside development is being planned at this point in that it includes Spanish type architectural features, such as the Campanile, placed in a setting of adobe walls and landscaped in a true Mission style with varieties of plant material brought in by the Padres in the eighteenth century.

SHADE TREE GROUPS

9. **KERN COUNTY**—North of Bakersfield. Over this arid section, trees are being planted in naturalistic groups to afford shade and create a point of interest in an otherwise scenically monotonous area.

10. **VENTURA COUNTY**—From Ventura to Mussel Shoal, 8 miles north. The road here traverses directly along the ocean edge and Palm trees are to be planted so that interesting ocean vistas will be created.

11. **LOS ANGELES COUNTY**—In Santa Monica along the famous Santa Monica Bluffs. Here the use of SERA workers will furnish the labor for this most difficult of beautification projects, the State furnishing the materials and supervision.

THIS PROJECT IS IMPORTANT FROM AN ECONOMIC AS WELL AS AN ESTHETIC POINT OF VIEW IN THAT PROPER PLANTING WILL REDUCE THE GREAT AMOUNT OF EROSION THAT TAKES PLACE ON THE SLOPE AT THE BASE OF THE BLUFFS DURING HEAVY RAINS.

PALMS WILL BE PLANTED

12. **SAN BERNARDINO COUNTY**—At the west entrance to San Bernardino. Palm trees and native shrubbery will be planted to beautify the city entrance.

13. **SAN BERNARDINO COUNTY**—Between Pomona and Ontario. Here the road traverses between orange groves and it is planned to plant the graceful

(Continued on page 24)

Bill Abolishes County Road Taxes

(Continued from page 1)

county roads, to come under one unified system, carefully engineered and with branches reaching out to even the most remote rural communities of the State where petitions may be placed by the people for road improvements. For these county roads, which bear only approximately 11% of the traffic of the State, the counties receive 33 1/3% of the entire State gasoline tax. This is in addition to the real estate taxes levied for county road purposes.

The Governor's road bill would:

First, declare all the present county roads to be State highways to be administered as such by the State. The present gas tax would carry the entire burden of this cost.

Second, repeal all laws permitting counties to levy taxes for highway purposes in any way whatsoever. This would save rural common property at least $6,000,000 per biennium.

Third, double the amount of gas tax moneys now allocated by law to the cities. This gives an additional $6,000,000 for relief of city taxpayers each biennium.

PRESENT FINANCING PICTURE

For a better understanding of the bill let us consider the present picture of highway financing in California. Four cents is collected on each gallon of gasoline you purchase, one cent of which goes to Uncle Sam. The remaining three cents is known as the State gasoline tax, but of this three cents, the State has in the past received only one and three-fourths cents, or a little more than half. The remainder has gone, one cent to the counties for the county roads, and one-fourth cent to the cities.

The counties, with one-third of the total gasoline tax plus such levies against real and personal property as they might make for road purposes, have supported roads which bear, as I said, 11% of the traffic of the State. These are the local feeder roads not in the State highway system either as primary or secondary highways and many of them are subject to irregular maintenance at rare intervals.

On the other hand, the State Department of Public Works maintains 14,000 miles of primary and secondary highways including all the trunk line traffic through both counties and cities upon which 47% of all traffic in California flows.

To do this work, the State has received but one and three-quarters cents of the three cents gas tax or a little more than half.

Of the total State traffic 42% is in the cities. In recognition of this large volume of traffic, the Governor's road bill doubles the amount which cities will receive from the gas tax fund.

PLAN ABOLISHES BONDS

The counties have heretofore issued highway bonds on which this year's principal and interest will total more than $6,000,000. Under the Governor's proposed plan, in the future, county bonds for highway purposes with corresponding increase in taxes will not be permitted.

In several portions of the State, almost unbearable burdens of taxes are being borne by real estate and home owners, due to the use of the special assessment scheme of financing highway improvements. Under this new plan, no more special assessment districts in rural areas can be created.

During the past six years in the fifty-seven counties, supervisors have spent $202,324,000 on county roads, of which 41% came from allotments in the form of Federal aid or State gasoline tax and motor vehicle fees, and the remaining 59% was raised from taxes against homes, farms and all forms of real and personal property. Of the latter sum, 7.6% was raised in the form of bond sales and 51.4% was direct taxation for county roads.

BOND TAXES UNNECESSARY

Under the Governor's plan counties, which are not now using any of the State allocations for the purpose of retiring county and special assessment district bonds, will be able to use a portion of such money therefor, and it is estimated that a further saving of a half million dollars annually will thereby be made to local property taxpayers.

Under the existing law, the counties which borrowed money from the State under the provisions of the Unemployment Relief Bond Act of 1933 will be required to start repaying such money in 1938. That means that new taxes will have to be raised or that the amount of work now being done by the counties on highways will have to be curtailed. Under the plan proposed, considering the saving which can be effected, neither of these alternatives will be necessary.

The expenditure of all moneys raised by the State for highway purposes, subject to the full control of the Legislature, will produce much greater results than the expenditure of the same amount of money on the existing basis. The reasons therefor are apparent.

(1) Proper engineering experience will be furnished for all highway problems, whereas at present, many of the counties handle their road problems without benefit of engineering advice.

(2) Wholesale buying will have been substituted for retail buying in purchase of all supplies and equipment.

(3) Heavy equipment will be used to near capacity instead of standing idle a great proportion of its time, as is necessarily the case when owned and operated locally by the counties.

(4) Needless duplication of services with attendant overhead expense will have been eliminated. At present, the State is maintaining a widespread system of State highways, running through every county. Fifty-seven county road departments are also being maintained, and most of these are again broken down into five separate agencies, each under control of one supervisor.

(5) Expenditures will be subject to the analysis made possible by accurate, uniform cost records and budgetary control.

NO GAS TAX DIVERSION

The gasoline tax has proved itself to be an efficient, cheaply collected and painless method of maintaining California's highway supremacy. Both the Governor and I, as head of the Department of Public Works, are vigorously opposed to the diversion of the gasoline

Homes and Farms Paying $12,000,000 Per Year for Roads

tax for any purpose other than that for which it was determined by a vote of our people, namely, the maintenance and construction of highways.

The people of California confirmed this viewpoint a little more than a year ago when they voted overwhelmingly against diverting gas tax revenues to any purpose other than highways. But if we are to maintain intact gasoline tax revenues for highways exclusively, we must see to it that the gasoline tax finances all the highways and that it is efficiently and economically expended.

Unbeknown to most of our citizens, the gasoline tax does not now nor has it previously ever financed all the highways. The gas tax has financed all State highways, all State highways through cities, but it has not paid the whole bill for maintaining the county road systems.

Homes and farms have been contributing to the upkeep of county roads to the extent of millions of dollars a year. It is estimated that during the past five years, an average of $12,000,000 a year was taken in taxes from homes and farms, real estate generally, as well as personal property such as furniture and savings accounts to build county roads. This money would have been saved under the Governor's road plan.

$40,000,000 FROM GENERAL FUNDS

An examination of the reports which the counties are required to file annually with the State Department of Public Works discloses the amazing fact that in the past five years from $5,000,000 to $11,000,000 taken from county general funds has been spent by the supervisors on county roads each year in addition to the regular county road taxes and State gasoline tax and motor vehicle fee allotments.

The law permits a 40c road tax against real estate and personal property, but in addition to this revenue the Boards of Supervisors have gone into the general county funds for more than $40,000,000 in the five years between 1929 and 1933 inclusive.

The special and district road taxes collected during this period total $16,060,214.71. Moneys taken from the general funds in the same period amounted to $44,565,218.72, making a total of $60,625,533.43 or an average of $12,125,106.68 per annum for the five year period, which the supervisors found necessary to supplement the State gas tax and motor vehicle fee allotments in order to meet their expenditures for construction and maintenance of the county road system.

FALLACIOUS ARGUMENTS ANSWERED

Some arguments have been advanced against the Governor's plan, many of which are the result of misinformation or lack of information.

1. It is said that desirable local control will be lost because the districts into which the State is divided for present State highway purposes are so large that any one interested in a local road problem will have difficulty in securing attention to it.

The fallacy in this argument is that it assumes the State would administer the enlarged mileage on the same basis as the old. The obvious thing which must be done, and which we plan to do, is to provide additional maintenance units under each district engineer for the purpose of meeting local highway problems. The men in charge of these units will be located at convenient points in the counties and not in the district office.

2. It is said that the funds will be insufficient to properly care for the local roads.

This is not a sound argument against State administration, but is an argument against doing away with the power to levy taxes or create local indebtedness for highway purposes. The fact remains, regardless of the amount of money to be expended on highways, that the State can do the job more efficiently and better than at present with the use of gas tax funds alone.

COUNTY CITIZENS DO WORK

It is obvious that this is not the time to provide additional revenues for highway purposes, and that under present conditions, common property taxpayers can not continue to bear the present burden for those purposes. I submit that legislation whereby relief can be afforded to such taxpayers without impairing the highway service furnished to the people is both constructive in purpose and in keeping with the necessities of the times.

3. The third argument advanced against this plan is that it will take employment out of the county as the State will bring in outside men.

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3,410,000 MOTOR TRUCKS USING HIGHWAYS IN U. S.

A recently published report on the automotive industry in the United States for 1934 shows that 21,430,000 motor cars and 3,410,000 motor trucks are using the highways of the Nation. Other interesting statistics are as follows:

Motor vehicles registered in U. S.	24,840,000
Motor cars	21,430,000
Motor trucks	3,410,000
Passenger cars on farms	4,134,675
Motor trucks on farms	900,385
Motor vehicles on farms	5,035,060
Miles of surfaced highways	960,000
Total miles of highways in U. S.	3,040,000
Highway and street expenditures	$1,600,000,000
Motor buses owned	112,200
Buses in revenue service	46,200
Buses in local or transit service	17,500
Consolidated schools using motor transportation	23,500
Buses used by consolidated schools	65,000
Buses used by street railways	11,000
Street railways using motor buses	210
Steam railroads using motor buses	62
Total car and truck dealers	36,900
Garages, service stations and repair shops	98,293
Total retail outlets, duplications eliminated	105,944
Wholesalers	5,759
Retail gasoline outlets	317,000

Nojoqui Grade Realignment Abolishes 33 Curves and Saves Nearly a Mile

By **LESTER H. GIBSON**, District Engineer

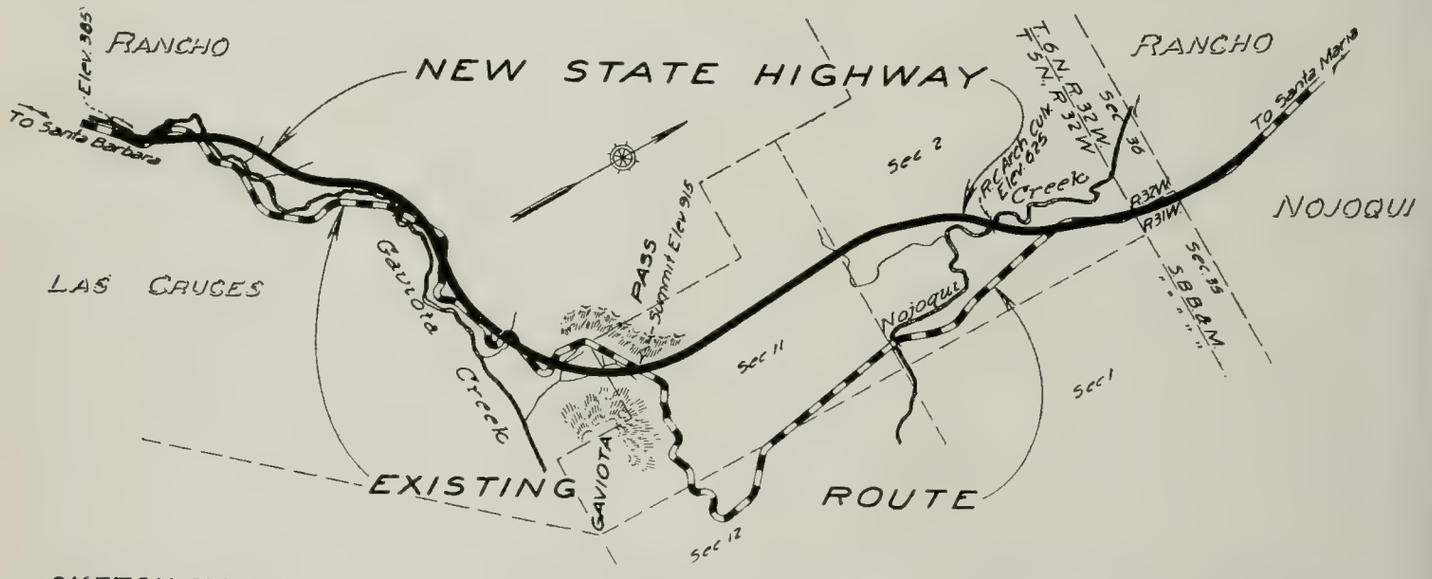
RECONSTRUCTION operations are now in full swing on the Nojoqui grade realignment on the Coast Highway (U. S. 101), in Santa Barbara County, where one of the few remaining barriers, or bottlenecks, to the coastwise motorist is rapidly being eliminated in favor of a modern high-speed highway.

When the motorist has traveled about 30 miles westerly from Santa Barbara over El Camino Real, he swings northward from the Pacific Ocean and passes through the historic Gaviota Gorge, and along Gaviota Creek to Las Cruces. From this point on for the next 4.5 miles, travel is on the Nojoqui grade over curves of 1500 feet. The vast improvement of this new road over the old is evident by the following comparative features:

Feature	Present	New
Total number of curves	44	11
Number of curves 1000′ radius or less	42	None
Number of curves 500′ radius or less	36	None
Minimum radius	100	1500
Total delta	2305°	373°
Maximum grade	7%	6%
Minimum vertical sight distance	315′	670′
Saving in distance	0.877 miles	

HEAVY GRADING PROJECT

The project is characterized by heavy grading, some 581,000 cubic yards in the 3.7 miles



SKETCH MAP shows route and curves of present Nojoqui grade compared with new alignment

Gaviota Pass, where an ascent of about 550 feet and a descent of about 300 feet are made over an exceedingly crooked road, and on grades ranging up to 7 per cent.

SCENE OF FREQUENT ACCIDENTS

This stretch of road has always been of much annoyance and delay to the motorist, as well as the scene of frequent accidents, and it has long ago outlived its usefulness to the ever-increasing flow or traffic accompanied by the higher speed of travel.

In November, 1934, operations started on a major project of realignment and reconstruction of this grade on the basis of a modern main line highway with minimum radius of length. This is in part due to the new road at the summit being in thorough cut over 40 feet lower than the present road. This large cut had its slopes benched to prevent erosion and major slides. The excavation in this one cut totals 160,000 cubic yards. All heavy excavation is being handled by 12-cubic-yard carryall scrapers, with bulldozers employed on light work.

Another feature of the work is the use of an imported borrow, or selected material subbase. This material is placed under the pavement to a minimum nine-inch thickness and on the shoulders to a depth of six inches. Prior to placing the selected material, a subgrade is prepared by rolling and then sealing

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NOJOQUI GRADE REALIGNMENT of U. S. 101 through Gaviota Pass in Santa Barbara County involves some heavy grading, 581,000 cubic yards as shown in pictures 1 and 2 and elimination of 33 curves as in No. 3.

How Huge Steel Bridge Cables Will Be Spun Across San Francisco Bay

By **C. H. PURCELL,** Chief Engineer, San Francisco-Oakland Bay Bridge

BEFORE the suspension cables of the San Francisco-Oakland Bay Bridge can be spun, it is necessary to build walk ways which will follow the general line the cable is later to follow.

There will be two catwalks, each 10 feet wide, one under each of the two cables. The walks will hang from four $2\frac{1}{4}$ inch ropes, each rope having a strength of 480,000 pounds.

The surface of the walk will be made of two layers of wire mesh, the lower layer made of chain link fabric, and the upper of "hardware" cloth with mesh about $\frac{1}{2}$ inch square. This mesh is laid on timber cross beams which are supported from the wire ropes at intervals of 10 feet. The walks will have handrails consisting of a single 9/16 inch wire cable.

CROSSWALK CONNECTIONS

The catwalks will be connected together by crosswalks, of which there will three in the center span and one in each of the side spans. These are for the purpose of bracing the two walks together and also to permit the workmen to cross from one catwalk to the other.

To add to the rigidity of the system, especially in times of storm, the storm cables are added. These consist of two one-inch lines in each span which are connected to the towers about 100 feet above the water, curve upwards, and are connected to the footwalk cables with wire hangers in such a way as to hold the footwalk cables in place.

Two cables for each footwalk have been placed between the San Francisco anchorage and Pier W-1 and two ropes for each walk between Towers W-2 and W-3. The next operation will be to raise the four ropes for each walk from Pier W-1 to Tower W-2, crossing the Embarcadero. Then the four ropes between the center anchorage and Tower W-3 will be placed. The final operations will be placing the last four ropes between Towers W-2 and W-3, and between the San Francisco anchorage and Pier W-1. With ropes all in place, the crosswalks will be erected.

CONSTRUCTING WIRE MESH

The next operation will consist in starting at Tower W-3 and putting the wire mesh construction simultaneously on each side of the

C. H. PURCELL

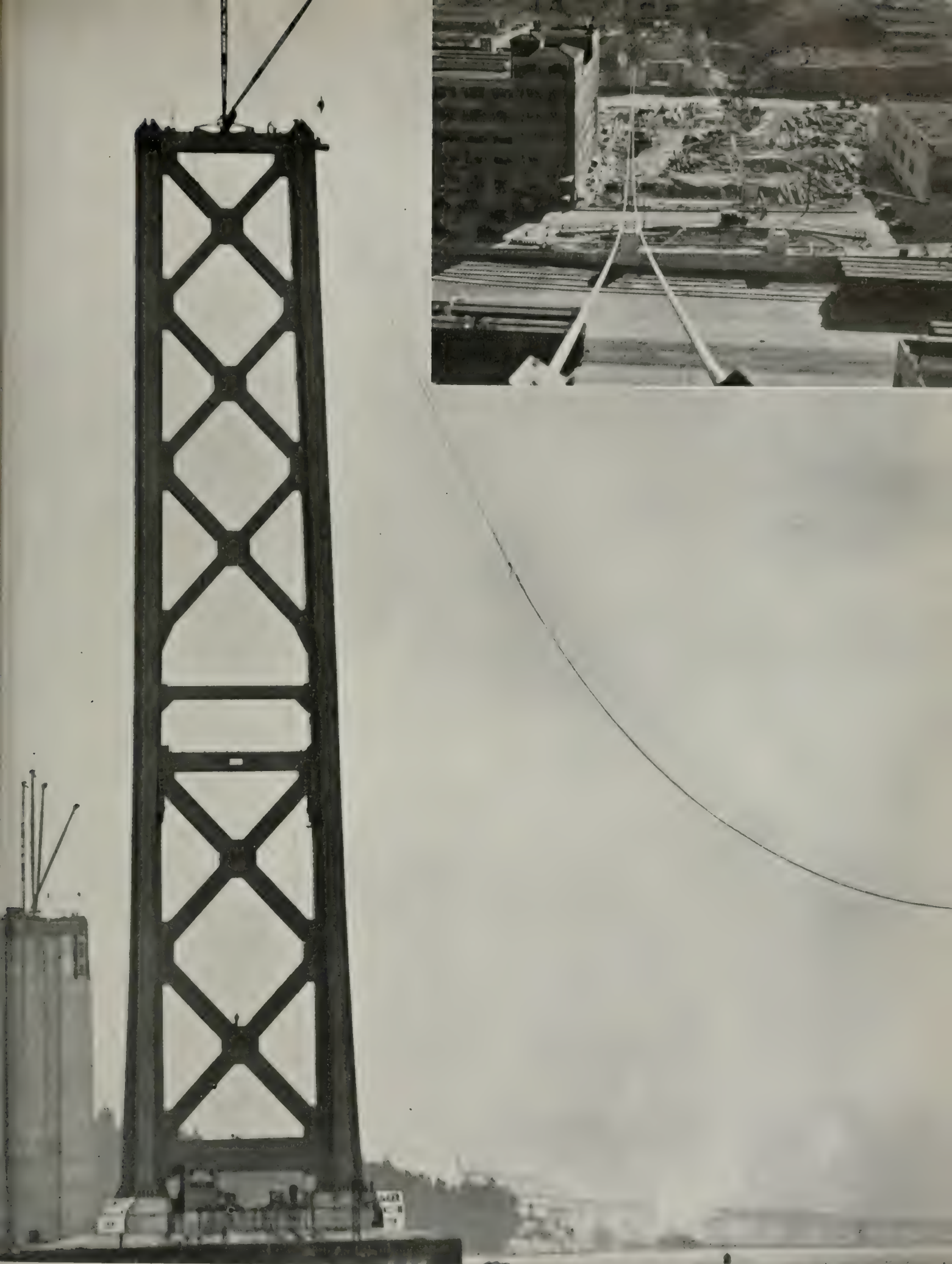
tower from Tower W-3 to the center anchorage, and from Tower W-3 to the center of the 2310-foot span. These sections are erected to platforms near the top of the tower, connected to the cable, and then slid along the cable to the final position. Upon completion of this operation, these platforms will be transferred to Tower W-2 and the same operation repeated.

After the wire mesh is all in place, it will be tightened to reduce the "spring" in the wire as much as possible. The storm cables will then be placed, completing the catwalks.

Following this, gallows frames will be erected. These consist of rectangular frames above each catwalk, at intervals of about 230 feet and at the towers, and to each are secured the haulage lines for the actual process of spinning the cable.

This haulage system consists in principle of an endless rope between the San Francisco

(Continued on page 15)



THE FIRST SAN FRANCISCO-OAKLAND BAY BRIDGE CABLE is seen being drawn across the waters of the bay on April 4th by a "messenger line" to Tower W-3 off the San Francisco shore. It is a 2¼ inch "catwalk rope," four of which will support a walkway for workmen during the big cable spinning job. Behind the tower, the camera has caught the great concrete mass of the Center Anchorage backgrounded by Yerba Buena Island and illusive tracings of the East Bay Superstructure making it appear almost completed. The inset shows four catwalk cables in place between Pier W-1 and the San Francisco Anchorage.

State Highway Winter Traffic Count Shows Slight Gain Over 1934 Figures

By **T. H. DENNIS**, Maintenance Engineer

THE regular semiannual count of traffic on the State highways was taken on Sunday and Monday, January 13 and 14, 1935, and covered the sixteen-hour period from 6.00 a.m. to 10.00 p.m. each day.

While it was, of course, impossible to man all of the points covered in the California Highway Transportation Survey of 1934, information developed by that study indicated the desirability of establishing some additional stations to those regularly used in the semiannual counts during the past eleven years. The results from these additional stations are included in this report.

TWO YEARS COMPARED

The following tabulation shows the gain or loss for the various classifications of roads, as compared with 1934:

Per Cent Gain or Loss for 1935 Count as Compared with 1934

	Sunday	Monday
All Routes	**—1.53**	**+2.41**
Main North and South Routes	**—4.23**	**+1.44**
Interstate Connections	**+8.91**	**+6.79**
Laterals Between Inland and Coast	**—0.04**	**+2.42**
Recreational Routes	**—6.15**	**+1.01**

In the aggregate, there is very little change from 1934, a small loss in Sunday traffic due to bad weather being balanced by a slight gain for Monday. In each road classification, Monday traffic registers a gain over the preceding year.

The greatest relative gain or loss occurred on recreational routes and interstate connections. The recreational routes show a loss of 6.15 per cent for Sunday, while there was a gain of 8.91 per cent on the interstate connections.

BAD WEATHER PREVAILED

Sunday traffic is greatly influenced by the weather. As shown below, inclement weather prevailed over the greater part of the State in 1935. This condition is in direct contrast to that of 1934, when fine weather was general.

District	**I.**	**Rain or snow, both Sunday and Monday.**
District	**II.**	**Rain or snow, both Sunday and Monday.**
District	**III.**	**Unsettled Sunday; rain Monday, with snow at higher altitudes.**
District	**IV.**	**Rain Sunday and Monday.**
District	**V.**	**Cloudy Sunday; rain Monday.**
District	**VI.**	**Fair Sunday; rain Monday.**
District	**VII.**	**Cloudy Sunday; rain Monday.**
District	**VIII.**	**Cloudy Sunday; fair Monday.**
District	**X.**	**Unsettled Sunday; rain Monday, with snow at higher elevations.**
District	**XI.**	**Cloudy; rain over eastern portion on Monday.**

The gain or loss in traffic for State Highway Routes 1 to 80, inclusive, expressed as a percentage of the January, 1934, count, is given below:

1935
Per cent gain or loss

Route	Termini	Sunday Loss	Sunday Gain	Monday Loss	Monday Gain
1.	Sausalito-Oregon Line	9.78	.....	5.55	.....
2.	Mexico Line-San Francisco	8.53	.....	.70	.....
3.	Sacramento-Oregon Line	2.00	.....	3.67	.....
4.	Los Angeles-Sacramento	.....	1.88	.....	4.31
5.	Santa Cruz-Jc. Rt. 65 near Mokelumne Hill	.....	11.87	.51	.....
6.	Napa-Sacramento via Winters	.....	1.18	.....	9.33
7.	Benicia-Tehama Jc.	1.43	.....	.....	11.28
8.	Ignacio-Cordelia via Napa	8.04	.....	4.13	.....
9.	Jc. Rt. 2 near Montalvo-San Bernardino	14.26	.....	4.38	.....
10.	Rt. 2 at San Lucas-Sequoia National Park	.....	44.08	5.83	.....
11.	Jc. Rt. 75 near Antioch-Nev. State Line via Placerville	.....	8.42	.....	.68
12.	San Diego-El Centro	7.20	.....	9.32	.....
13.	Jc. Rt. 4 at Salida-Jc. Rt. 23 at Sonora Jc.	.....	43.37	.....	7.91
14.	Albany-Martinez	.....	7.67	.....	12.62
15.	Rt. 1 near Calpella-Rt. 37 near Cisco	.....	4.02	3.89	.....
16.	Hopland-Lakeport	1.19	.....	4.71	.....
17.	Jc. Rt. 3 at Roseville-Jc. Rt. 15, Nevada City	.....	10.45	.....	13.04
18.	Jc. Rt. 4 at Merced-Jc. Rt. 40 near Sequoia	.....	9.34	.....	10.85
19.	Jc. Rt. 2 at Fullerton-Jc. Rt. 26 at Beaumont	5.87	.....	.....	6.27
20.	Jc. Rt. 1 near Arcata-Jc. Rt. 83 at Park Bdy.	6.72	.....	15.15	.....
21.	Jc. Rt. 3 near Richvale-Jc. Rt. 29 near Chilcoot via Quincy	42.05	.....	37.01	.....
22.	Jc. Rt. 56, Castroville-Jc. Rt. 29 via Hollister	.....	5.85	1.50	.....
23.	Saugus-Rt. 11, Alpine Jc.	.....	8.35	.....	10.42
24.	Jc. Rt. 4 near Lodi-Nev. State Line	.....	35.60	.....	13.85
25.	Jc. Rt. 37 at Colfax-Jc. Rt. 83 near Sattley	.....	24.43	1.10	.....
26.	Los Angeles-Mexico via San Bernardino	.....	6.27	.....	12.70
27.	El Centro-Yuma	18.32	.....	22.87	.....
28.	Redding-Nevada Line via Alturas	.....	10.17	32.19	.....
29.	Peanut-Nevada Line near Purdy's	30.86	.....	29.96	.....
31.	San Bernardino-Nevada State Line	.....	51.17	.....	6.23
32.	Jc. Rt. 56, Watsonville-Rt. 4 near Califa	.....	20.09	.....	12.37
33.	Rt. 56 near Cambria-Rt. 4 near Famosa	.....	27.34	.....	28.89
34.	Jc. Rt. 4 at Galt-Rt. 23 at Pickett's Jc.	.....	8.45	4.19	.....
35.	Jc. Rt. 1 at Alton-Jc. Rt. 20 at Douglas City	2.59	.....	7.23	.....
37.	Auburn-Truckee	.....	17.10	4.80	.....
38.	Jc. Rt. 11 at Mays-Nevada Line via Truckee River	1.20	.....	.....	15.25
39.	Jc. Rt. 38 at Tahoe City-Nevada State Line	11.59	.....	.....	.....

Monday Traffic Gains Reflect Effect of Bad Sunday Weather

(Continued from preceding page)

Route	Termini	1935 Per cent gain or loss Sunday Loss	Sunday Gain	Monday Loss	Monday Gain
40.	Jc. Rt. 13 near Montezuma-Jc. Rt. 76 at Benton	....	72.81	....	12.98
41.	Jc. Rt. 5 near Tracy-Kings River Canyon via Fresno	....	10.93	.92	....
42.	Redwood Park-Los Gatos	.....	15.28	.....	21.81
43.	Jc. Rt. 60 at Newport Beach-Jc. Rt. 31 near Victorville	....	8.19	.....	11.67
44.	Boulder Creek-Redwood Park	....	15.76	.....	25.32
45.	Jc. Rt. 7, Willows-Jc. Rt. 3 near Biggs	8.52	.....	.....	13.83
46.	Rt. 1 near Klamath-Rt. 3 near Cray	22.56	....	13.26	.....
47.	Jc. Rt. 7, Orland-Jc. Rt. 29 near Morgan	16.74	....	.....	21.36
48.	Rt. 1 near McDonalds-Rt. 56 near Albion	56.56	.....	34.11	.....
49.	Napa to Jc. Rt. 15 near Sweet Hollow Summit	13.99	.....	10.94	....
50.	Sacramento-Jc. Rt. 15	....	18.40	.....	4.59
51.	Jc. Rt. 8 at Schellville-Sebastopol	19.80	.....	....	8.32
52.	Alto-Tiburon	22.60	.....	19.40	.....
53.	Jc. Rt. 7 at Fairfield-Jc. Rt. 4 at Lodi via Rio Vista	.....	.94	.02	.....
54.	Jc. Rt. 11 at Perkins-Jc. Rt. 65 at Central House	6.74	.....	12.50	.....
55.	Jc. Rt. 5 near Glenwood-San Francisco	4.87	.....	.13	.....
56.	Jc. Rt. 2 at Las Cruces-Rt. 1 near Fernbridge	13.30	.....	6.44	.....
57.	Rt. 2 near Santa Maria-Rt. 23 near Freeman via Bakersfield	.....	30.84	.....	28.89
58.	Rt. 2 near Santa Margarita-Ariz. Line near Topoc via Mojave & Barstow	.....	33.39	.....	36.20
59.	Jc. Rt. 4 at Baileys-Jc. Rt. 43 at Lake Arrowhead	.....	18.17	....	20.85
60.	Jc. Rt. 2 at Serra-Jc. Rt. 2 at El Rio	20.14	....	1.75	....
61.	Jc. Rt. 4 S. of Glendale-Jc. Rt. 59 near Phelan	18.30	.....	.....	2.15
63.	Big Pine-Nevada State Line	.....	22.77	.....	59.85
64.	Jc. Rt. 2 at San Juan Capistrano-Blythe	7.24	.....	.....	9.24
65.	Jc. Rt. 18 near Mariposa-Auburn	.....	14.49	.....	.72
66.	Jc. Rt. 5 near Mossdale-Jc. Rt. 13 near Oakdale	.....	16.31	.....	9.04
67.	Pajara River-Rt. 2 near San Benito River Bridge	2.06	.....	4.90	....
68.	San Jose-San Francisco	....	4.04	....	10.58
69.	Jc. Rt. 5 at Warm Springs-Jc. Rt. 2, San Rafael	.....	6.91	....	9.86
70.	Ukiah-Talmage	...	2.69	.	1.42
71.	Crescent City-Oregon Line	13.78	.....	13.57	.....
72.	Weed-Oregon Line	....	21.88	....	73.13
73.	Rt. 29 near Jamesville-Oregon Line	3.57	.....	15.35	.....
74.	Carquinez Bridge-Napa Wye	.68	....	12.80	....
75.	Oakland-Jc. Rt. 65 at Altaville	....	5.45	7.37	.....
76.	Jc. Rt. 125 at Shaw Ave.-Nevada State Line near Benton	....	10.89	9.13	....
77.	San Diego-Pomona	9.95	....	.....	6.57
78.	Jc. Rt. 12 near Descanso-Jc. Rt. 19 near March Field	5.73	.....	.....	3.11
79.	Jc. Rt. 2, Ventura-Jc. Rt. 4 at Castaic	1.09	.....	.....	4.64
80.	Jc. Rt. 51, Rincon Creek-Rt. 2 near Zaca	2.27	.....	.....	8.00

TAX URGED ON ALL MOTOR FUELS

Improvements in internal combustion motors are making it possible for more and more motor vehicles to use fuels other than gasoline. Such fuels are not subject to the Minnesota gasoline tax. It is obviously unjust to tax the gasoline used in most motor vehicles and not tax a different fuel used in other motor vehicles transporting commodities on the public highways. Remedial legislation is needed.—*Minnesota Bulletin.*

Betsy—My husband is a hateful wretch.

Peggy—What's he done now?

Betsy—He pretended to believe me last night when he knew I was lying to him.

17,464 Wires Used in Building Up Every Bay Bridge Cable

(Continued from page 12)

anchorage and the center anchorage. Two spinning wheels, five feet in diameter, are placed on this rope over each footbridge; also, at each anchorage are located the drive for this machinery and a system of towers with sheaves, or grooved wheels, over which the cable wire passes so as to maintain a uniform tension on the wire.

The cable wire is being brought from eastern mills in 5-foot diameter coils, each coil containing 350 pounds, or about 3500 feet of wire. The steel company has installed at its Twentieth Street plant a reeling set-up in which the wire is taken from these coils and placed on reels, each reel containing 32,000 pounds, or nearly 60 miles, of wire.

For the west suspension bridge, 50 per cent of these reels will be taken to the San Francisco anchorage, 50 per cent to the center anchorage, and placed in the reel stands.

SPINNING WHEEL OPERATION

In the spinning operation, starting at the San Francisco anchorage, a bight, or loop, of wire is taken from the reel, passed around the spinning wheel, the haulage machinery is set into operation, and the wheel passes from the San Francisco anchorage to the center anchorage, carrying this bight, or total of two wires. Arriving at the center anchorage, this loop is removed from the spinning wheel, passed around the strand shoes, a new loop taken off one of the reels at the center anchorage, and the journey repeated.

In place of the single loop the contractor is planning to take two loops, thereby placing four wires per trip of the spinning wheel.

Each cable strand contains 472 wires so that each strand requires 236 trips of the spinning wheel. Except for the center, or nineteenth strand, which is laid up by itself, the strands are spun in sets of four, each set being adjusted to correct elevation before starting succeeding strands. There will be 37 strands, or a total of 17,464 individual wires.

SPINNING STARTS MAY 15

The question is often asked how we know that there is an equal tension in all wires. This may be answered by the statement that we adjust all wires to the same sag, and that

(Continued on page 24)

Russian River Bridge at Monte Rio in Redwood Empire Formally Dedicated

OVER three thousand people gathered among the redwoods and along the shore of the Russian River to participate in the colorful ceremonies surrounding the formal dedication of the new bridge spanning the Russian River at Monte Rio, on Sunday, March 31st.

The bridge was built as a Joint Highway District project initiated by the Boards of Supervisors of Sonoma and Mendocino Counties at a total cost of $125,000. The California Highway Commission, with the approval of the Director of Public Works, participated in the construction of the bridge and was represented at the dedication by Highway Commissioner Timothy Reardon of San Francisco, in whose district the Russian River is located.

The Monte Rio Bridge celebration was initiated by the Monte Rio Chamber of Commerce, with the support and cooperation of the Redwood Empire Association.

CHRISTENED WITH VODKA

Speakers on the program included: Governor Frank F. Merriam; H. G. Ridgway, chairman Events Committee, Redwood Empire Association; Highway Commissioner Timothy A. Reardon; Edward J. Neron, Deputy Director State Department of Public Works; Senator Herbert Slater; Assemblyman Hubert Scudder; Supervisor A. M. Brown, Jr., of San Francisco and Supervisors Tom Ferguson, Charles Perkins and Willard Cole, directors of the Joint Highways District in charge of construction of the bridge; J. B. Piatt, Chief Engineer for the Bridge District; Miss Margaret Hess, granddaughter of a pioneer family in the Russian River section.

High light of the ceremonies was the christening of the new bridge by Miss Irene Pershime, descendant of one of the earliest Russian settlers of Fort Ross on the Sonoma County Coast in 1812, who cracked a bottle of old Russian vodka; followed by Miss Ruth Sheridan, granddaughter of the late Captain Sheridan, Russian River pioneer, who settled near the site of the new steel and concrete span in 1860. Miss Sheridan broke on the bridge railing a bottle of champagne made on the Russian River. This ceremonial was presented by State Railroad Commissioner Wallace L. Ware.

ENTERTAINED AT LUNCHEON

William Healy, president of the Monte Rio Chamber of Commerce, presided as toastmaster. During the program he introduced numerous other State officials and civic leaders and presented scions of pioneer Russian River families.

Preceding the celebration, official guests were entertained at a luncheon by the Ladies Auxiliary of the Chamber of Commerce and the Chamber directors.

Other State highway officials participating included: L. V. Campbell, Engineer Cooperative Projects, Division of Highways, and T. H. Dennis, Maintenance Engineer, Division of Highways.

Governor Merriam delighted his audience with his refreshing humor, pleased them with his expressions in favor of united, cooperative effort by chambers of commerce and civic organizations in requesting and securing appropriations for highway construction and improvement and enthused them with his optimism and progressive thought.

GOVERNOR MERRIAM LAUDED

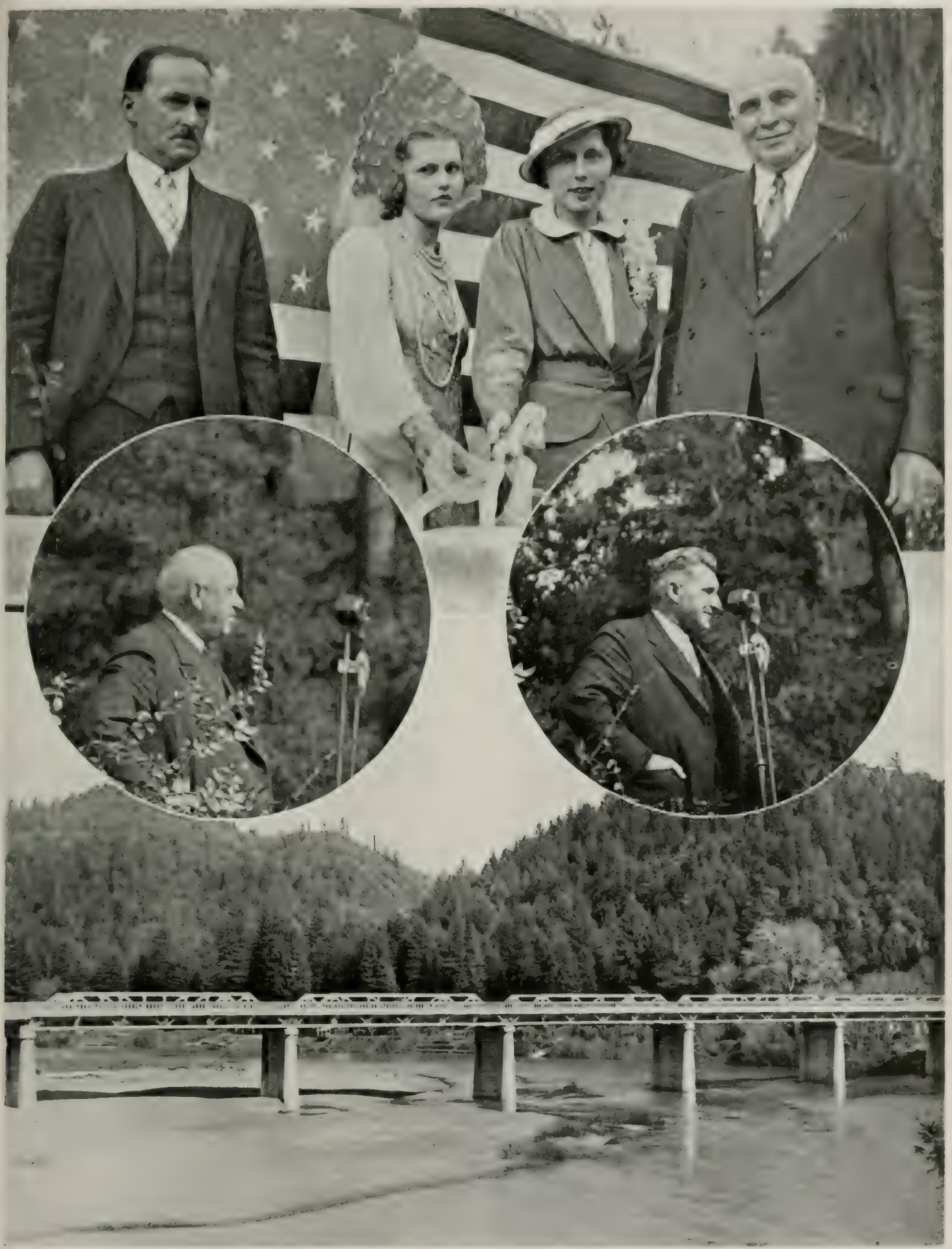
Other speakers on the program lauded Governor Merriam for his stand against diversion of the gas tax and for his progressive attitude toward State highway construction.

Preceding the Governor's address, the Analy High School Band of Sebastopol, which entertained the celebrants during the program, dedicated an Iowa State song to Governor Merriam.

A bevy of Russian River lassies, in vacation attire, brought gifts in a Russian River canoe and presented them to the Governor, in the form of Sonoma County products.

Highway Commissioner Timothy A. Reardon pointed out the need for making possible ingress and egress to various parts of the Redwood Empire—in greater comfort and safety and with the expenditure of less time—by improving State highways therein. He lauded the work of civic organizations such as the Redwood Empire Association, Chambers of Commerce and others in cooperation with

(Continued on page 18)



DEDICATING THE RUSSIAN RIVER BRIDGE at Monte Rio, Governor Merriam was assisted in the ceremonies by President William Healy of the Monte Rio Chamber of Commerce; Irene Pershime, descendant of Russian pioneers who christened the bridge with vodka while Miss Ruth Sheridan descendant of American pioneers broke a bottle of Sonoma champagne on the structure. Deputy Director of Public Works, Edward J. Neron is at the microphone in the right inset and Highway Commissioner T. A. Reardon, at left. The bridge cost $125,000.

County Road Costs Treble State's

(Continued from page 9)

A proper amendment has already been introduced, making it mandatory upon the State that men shall be employed from the county in which the work is to be done.

4. The objection has been raised that counties which did not borrow money from the State under the provisions of the Unemployment Relief Bond Act of 1933 will be deprived of a portion of their road fund alotments in order to assist borrowing counties in repaying loans in 1938.

This is not true. Under Governor Merriam's bill as amended, the State is obligated to spend in each county the same proportion of gas tax and motor vehicle fees as the county now receives. The provisions permitting boards of supervisors to retire general county bonds or to pay unemployment relief loans out of the State-raised revenues are not mandatory, but are merely permissive. If any board is of the opinion that the retirement of its bonds or the payment of the relief loans is of first importance, the money will be turned over to the supervisors for that purpose by the State and will be deducted from the allotment for highway purposes to that county without imposing a burden on any other county.

SAVING PROPERTY TAXES

The keystone of the Governor's proposal is that common property taxpayers shall be afforded relief without increasing taxes elsewhere. The saving is to be made by the sound business principle of eliminating unnecessary duplication of investment and equipment.

It should also be distinctly understood that the Governor's suggestion to levy an additional one-cent per gallon gasoline tax was specified by him as an emergency measure for the purpose of providing necessary funds for unemployment relief, and is in no way associated with, or necessary to, his proposal for the consolidation of the State and county highway system.

The California transportation survey makes available facts which show how very conservative is the Governor's estimate of a $16,000,000 biennial saving under his plan.

We now know that had the Governor's road bill been in effect since the inception of the gas tax almost $40,000,000 a biennium would have been saved to the common property tax payers in road levies alone.

HIGH COUNTY COSTS

The survey also shows that the State now spends 4.6 mills per vehicle mile on constsruction and maintenance of State highways, where the counties spend 12.6 mills on the county roads. Thus, the supervisors spend three times as much as the State upon roads which carry but 11% of the traffic of California.

The figures of the cost for vehicle regulation and highway costs and maintenance per vehicle mile in 1933 in California by the three governmental units are as follows:

State	$0.0046
Counties	.0126
Cities	.0040

Apart from the tax reducing feature of the Governor's road bill, its importance lies in the fact that it improves, unifies and renders more efficient California's system of highways so that their gasoline tax pennies do a maximum amount of work with a minimum of waste.

We therefore commend for the earnest consideration of all Californians the highway unification measure recommended by Governor Merriam. This road bill will abolish road taxes against property and make the gas tax pay the whole road bill for which it is collected and will place all county roads into the State highway system to be maintained by the Department of Public Works.

Construction of highways will proceed as usual. It will be under State supervision and employment of men will continue as now, the men being taken from the county in which the road work lies.

RUSSIAN RIVER BRIDGE AT MONTE RIO DEDICATED

(Continued from page 16)

State Senators and Assemblymen and supervisors in connection with highway improvement projects.

GREETINGS FROM DIRECTOR KELLY

Edward J. Neron, Deputy Director of the Department of Public Works, extended the greetings of Director Earl Lee Kelly and complimented the citizenry of the Russian River, Sonoma County and the Redwood Empire as a whole on their progressive attitude toward highways.

H. G. Ridgway, chairman of the Events Committee of the Redwood Empire Association, thanked Mr. Reardon and other members of the Commission, also Director Kelly and the Governor for the allocations in favor of the Monte Rio Bridge and other sectors of the Redwood Empire system of highways and pointed out that the association was actively engaged in opposing bills calling for the diversion of the gas tax.

Supervisor Arthur M. Brown, Jr., of San Francisco, thanked the Governor and State officials for allocations in favor of the approach to the Golden Gate Bridge and presented San Francisco's greetings to guests and citizens of the Northbay counties.

American River Bridge Widened to Provide Four Traffic Lanes

(Continued from page 2)

President Harold J. McCurry, Sacramento Chamber of Commerce; President W. H. Pimentel, North Sacramento Chamber of Commerce; County Executive C. W. Deterding; Supervisor Ollie Mapes, and Clyde L. Filbert, general chairman.

In the reconstruction of the bridge, which was done without interruption of traffic, a new alignment was established with the center line out three feet from the old upstream rail and the curve on the Sacramento approach lengthened out to a radius of 600 feet and a 3 per cent grade.

The specifications called for a 44-foot roadway with five-foot sidewalks and 12-foot curbs for the protection of pedestrians, the widening to be done on the upstream side of the old bridge. This widening caused an eccentric load on the foundations necessitating the use of 40-pound, 8-foot steel H beams for piling in the new footings which proved very satisfactory, for at elevation —35.0, a cemented gravel formation gave excellent bearing value.

PIERS WERE WIDENED

The piers and abutments were widened on the upstream side and additions made to the downstream side for conformity in design. In cooperation with the Division of Architecture of the Department of Public Works the new piers were designed to stream line into the light pylons which extended 18 feet above the roadway elevation.

New arches were constructed independent of the old structure and the roadway slab was supported by walls carried on the arches. A six-inch spandrel face wall was used for architectural reasons. Both sidewalks were of a cantilever construction with three-foot modernistic step-back rails.

On the old portion of the bridge, the existing pavement was removed and replaced with new concrete to conform with the new portion as to alignment and grade.

ARTISTIC PYLON LIGHTS

The lights capping the pylons are of opalescent glass set in bronze frames three feet in height and designed to conform with the pylons. 300-watt globes are being used, giving ample light for pedestrians and being diffused by the opalescent glass, there is no glare to the motorist.

HAULING COSTS REDUCED FROM $1.00 TO $0.03 PER TON MILE BY GOOD HIGHWAYS

How the decline in the cost of road transportation has kept pace with the progress of highway development is illustrated in the comprehensive motor traffic survey recently completed by the Division of Highways.

The report cites the business done by the Pioneer Stage Line on the Placerville route to Carson City and Virginia City in 1861 and 1862. During that period there were 93 hotels on the road and the stage company employed 50 men and 600 horses. The estimated amount of business done annually on this mountain route in 1861 and 1862 was:

30,000 tons of freight @ $100 per ton	$3,000,000
36,500 passengers @ $30	1,095,000
Meals and express	125,000

Indicative of the bearing good roads have on transportation expense the report notes the following comparative costs of hauling at different periods since 1862:

Year	Costs per ton mile
1862	$1 00
1894	25
1922	10
1932	03

The approaches were widened to a 40-foot concrete pavement with 9-foot shoulders on the south to the junction of 16th and 12th streets, and on the north to an approximate distance of 300 feet, where the new four-lane pavement was flared into the existing three-lane pavement.

The modernistic design is very pleasing and has been the cause of much favorable comment. The added roadway width and realignment has relieved the traffic congestion to such an extent that a State Traffic Officer stationed at the junction of 12th and 16th streets has been removed.

This bridge site has been associated with California history ever since Jedediah Strong Smith, a trapper, and his companions camped by these waters in 1827, to be followed by the '49ers who used a gravel bar as a fording place on their way to the gold fields.

In the middle fifties, a ferry was operated and when, in 1858, it became inadequate, a pile trestle bridge was constructed. It was operated as a toll bridge by J. B. Haggin. In 1886, the franchise was purchased by the county for the sum of $2,500 and the bridge was then opened to the public.

In 1887, the bridge was condemned as unsafe and replaced by another wooden bridge with three 198-foot wooden trusses supported

(Continued on page 32)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ..... Director
JOHN W. HOWE ..... Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 APRIL, 1935 No. 4

A Mile of Highway

To build a mile of modern highway, two long trainloads of materials must be gathered together and sent to the site of the new road.

That, in a nutshell, summarizes the broad expanse of employment that goes with the construction of roads and streets.

As you pass a construction project in your community, you do not see anywhere near all the workmen that are engaged on it. For every man employed on the road job itself, the equivalent time of one to one and a half men is needed behind the lines supplying equipment and material.

What does this mean to you or your local business men? Two things:

1. Local men have a means of livelihood; they are receiving pay checks that flow through their pockets to pay bills and taxes, to buy food, clothing and other necessities.

2. The equipment and materials used in that local project are produced in your vicinity or elsewhere, providing widespread employment that not only gives men jobs but provides a general business activity.

Road and street construction, therefore, pumps money from worker to worker, both locally and over a wide area.

From 85 to 90 cents of the dollar spent by the contractor quite promptly goes into the pockets of labor, according to surveys of the U. S. Bureau of Public Roads. Workmen in a variety of industries are benefited; men in mines, quarries, mills, factories, in sand and gravel plants and on the railroads, all get a share of the road dollar. Then there are the men on the road job itself who directly get a large share.—*Florida Public Works.*

Autos in California Averaged 601 Gallons of Gasoline in 1934

OPERATORS of motor vehicles in California who do not keep a record of the amount of gasoline their cars consume will be interested to know that it is approximately 601 gallons annually.

At least, this was the average amount of gas used by owners of passenger and freight automobiles in this State last year, according to an estimate, based on an investigation made during compilation of an extensive road transportation survey by the Division of Highways.

There were registered in this State in 1934 a total of 1,712,000 passenger motor vehicles. In making the highway transportation report, drivers of 108,000 of these cars were questioned concerning yearly gasoline consumption and mileage per gallon.

It was learned that the average passenger car obtained 15.25 miles of travel per gallon.

TRUCKS AVERAGED 10.64 M. P. G.

A truck survey which covered 32,400 of these vehicles or approximately 11 per cent of the total of 288,409, disclosed an average of 10.64 miles per gallon.

The average mileage developed per gallon of gasoline, computed for all vehicles on the basis of the total annual vehicle miles in the State, was 13.86 miles per gallon.

Gasoline consumed annually from 1924 to 1931 increased steadily and at a more rapid rate than the increase in motor vehicle registration. Beginning in 1932, there commenced a decline in both motor vehicle registration and gasoline consumption which continued until 1933. Registrations and gasoline consumed in 1934 slightly exceeded comparable figures for 1933.

CONSUMPTION SHOWS INCREASE

The gasoline consumed per vehicle throughout these two periods of increase and decrease in vehicle registrations is considered of interest, for in this period the annual gasoline consumption per vehicle increased from 533 gallons in 1924 to 611 gallons in 1932. There was a slight drop to 603 gallons in 1933, and a further drop to 601 gallons in 1934.

"The relatively small decrease in the use of vehicles during a period when return value for expenditures is very carefully considered," the report says, "is striking proof of the worth of motor transportation."

A $170,000,000 CONFERENCE—Governor Merriam, Public Works Director Earl Lee Kelly and State Engineer Hyatt (right) discussing Central Valley Water Project before latter's departure for Washington.

State Water Plan Urged in Washington

Anticipating the passage of President Roosevelt's $4,880,000,000 emergency relief appropriation bill and the possible allocation of a part of that fund to California for construction of the Central Valley Water Project, Governor Merriam, after a conference with Director of Public Works Earl Lee Kelly and State Engineer Edward Hyatt, dispatched the latter to Washington April 2d to confer with Federal officials.

Mr. Hyatt will discuss with them the outstanding features of the great project for restraining salt water encroachments in the Sacramento-San Joaquin delta and furnishing water to lands in the San Joaquin Valley now under cultivation for which the water supply is being rapidly depleted.

Having received the approval of Federal agencies after exhaustive investigation it is believed the project stands a chance of early participation in the President's fund.

The first authorization for Federal aid to the project is contained in the Rivers and Harbors bill passed by the House of Representatives Tuesday, April 9th, and sent to the Senate, providing a $12,000,000 contribution for construction of Kennett Dam by reason of its flood control, navigation, and saline control benefits, as recommended by U. S. water department engineers.

The cost estimates of the physical works of the Central Valley project are as follows: Kennett Dam, including relocation of the Southern Pacific Railroad, afterbay dam, and two power houses, $84,000,000; transmission line, $14,000,000; industrial conduit, $2,500,000; San Joaquin pumping system, $20,000,000; Friant Dam, $14,000,000; canals leading from Friant Reservoir, $30,000,000; total including miscellaneous items between $165,000,000 and $170,000,000.

In addition to the $12,000,000 provided for Kennett Dam in the Rivers and Harbors bill application of the California Water Project Authority asks for a grant of 30 per cent of the cost of labor and materials on the balance, amounting to $37,000,000 and for the Public Works Administration to accept revenue bonds to the extent of $116,000,000 for the remainder of the financing.

Skilful Work of Engineers Saved Highway in 200,000 Cubic Yard Slide

By **COL. JNO. H. SKEGGS,** District Engineer

IN THE construction of a new State highway in Marin County between Sausalito and San Rafael, which offered a saving of four miles in an original distance of twelve miles, a series of low spurs radiating from Mount Tamalpais had to be crossed, one of them just north of Alto.

A pass was found through this spur that permitted excellent alignment with short runs of maximum grade and with a summit cut about thirty feet in depth on centerline and nearly one hundred feet deep on the upper slope.

This terrain, being a part of the Coast Range, is geologically one of Nature's last-born and has many of the characteristics of a spoiled child, particularly in its disposition to wander from its ancestral home.

SLIDE CONDITIONS EXPECTED

Surface indications and some acquaintance with the behavior of similar formations led us to expect slide conditions and during the construction period in 1929 this was taken into account and a series of steps were cut into the slopes where it seemed warranted, for the purpose of relieving pressure on the cut slope and providing storage space for minor slides, thus preventing them from reaching the roadway.

We rather prided ourselves on this achievement, and little trouble was experienced in this thorough cut, except the ordinary mud slides from long slopes during rainy weather, until late last fall (1934) when an enormous mass on the west side of the road commenced moving from the higher hills into the cut.

The movement was at such a rate and involved such large quantities that it was a moral certainty the road would be closed within a very short period unless immediate steps on a large scale were undertaken to prevent this condition. The necessary authorization and allotment was approved and within a few weeks a contract was let, heavy equipment assembled, and the work commenced.

It was planned to remove the material in a series of giant benches, and this method was followed as closely as possible. However, the movements taking place destroyed the benches almost as soon as they were graded, and the ultimate appearance of the cut is quite different from the symmetrical planned cross section.

Many sections of the slide were quite rocky and when first exposed had the appearance of solid masses. It was soon discovered, however, that the movement had sheared the rock into small fragments that could be easily loaded by the shovel without the necessity of blasting.

It was necessary to remove approximately 200,000 cubic yards of material, which was utilized to widen the roadbed for a distance of several miles on each side of the slide. Traffic was carried through the work at all times, and there was seldom any delay.

EXACT CAUSE UNDETERMINED

As stated above, the movement started late in the fall before the above-average rainfall of last winter set in, and therefore the movement can not be ascribed to heavy rains as the rainfall for the past several years has been considerably below normal.

The exact cause of these major slides is difficult to determine, being a combination of moisture, instability of soil, steep inclination of strata, and a rock incapable of carrying the load when lateral restraint is removed, such as happens when a large thorough or sidehill cut is made. The immediate cause may very well have been a series of light earthquakes which occurred shortly before the new extensive surface cracks were noted.

AUTOS TO USE OLD TROLLEY TUNNEL IN NEW YORK CITY

The old New York City Park Avenue trolley tunnel, through which the Madison Avenue cars used to pass between Thirty-second Street and Forty-second Street is being converted into a vehicular tunnel for automobile passenger traffic. This utilization of the tunnel for vehicles will increase the traffic capacity of Park Avenue below Forty-second Street by adding a new northbound and a new southbound lane, both underground and free of intersections or traffic stops between the end of Fourth Avenue at Thirty-second Street and the mouth of the tunnel in front of Grand Central Station.—*Roads and Streets.*

AN OMINOUS CRACK APPEARED after a rain period in a low spur of Mt. Tamalpais in Marin County and a great mass began moving down upon the highway cut.

GIANT BENCHES WERE CUT for the removal of the slide material but the movements destroyed them almost as soon as they were graded. A total of 200,000 cubic yards of material was moved and the highway kept open at all times. Height of slide can be judged by comparison with size of the automobile on the highway in foreground.

Tree Planting Project for Montecito

(Continued from page 7)

Cocos Palm which is becoming so typical in the Orange Belt.

14. **SOLANO COUNTY**—The landscaping of the Cordelia Subway on State Route No. 7.

15. **SAN DIEGO COUNTY**—Between Encinitas and Oceanside. Cypress trees are being planted in groups where the highway runs along the top edge of the ocean bluffs and is subject to hard prevailing winds.

OLD TREES SAVED

A great deal of expense was involved on this construction project for the sole purpose of saving a row of old Eucalyptus and Cypress trees. Extra right of way was purchased in order to make it possible to lay two lanes of pavement separated by these trees.

Flowering types of shrubbery are to be planted along this section and the project is being rushed in order to be completed before the opening of the Exposition in San Diego.

EXTENSIVE LANDSCAPE PROJECT

16. **LOS ANGELES COUNTY**—Between Monterey Park and Mission Road in Los Angeles. This project represents the State's first comprehensive landscape project. Water lines have been laid the entire length of the job to care for the planting of trees and shrubbery and no expense was spared in an endeavor to make this major traffic artery an example of correct roadside planting.

A small but very important landscape project has just been completed by State forces through Montecito from Olive Mill Road to the east city limits of Santa Barbara. This section of Montecito was designated as a business zone by the Santa Barbara County Planning Commission.

During construction it was found necessary to remove the beautiful old Blue Gum Eucalyptus trees that produced a quaint and rural atmosphere for this section. The removal of these trees is a great loss to Montecito, but the danger of the limbs falling during wind storms and the fact that the large trunks obscured the various business enterprises from the road made it best, in the long run, for all concerned, that they be removed and replaced by a more slender trunk type of tree planted on both sides of the road and placed at locations that would not interfere with business.

The situation here was unusual, particularly for an area zoned for business, in that the property owners concerned were very insistent that the old trees be removed because of their condition, size, and location; and yet on the other hand, when approached regarding the selection of non-interfering locations for new trees, their enthusiasm and desire was surprising, and every effort was made by these people to cooperate with the State to illustrate that a business street need not necessarily be void of beauty. In other words, Montecito business people appreciate the value of attractive roadsides and realize the magnetic attraction of trees.

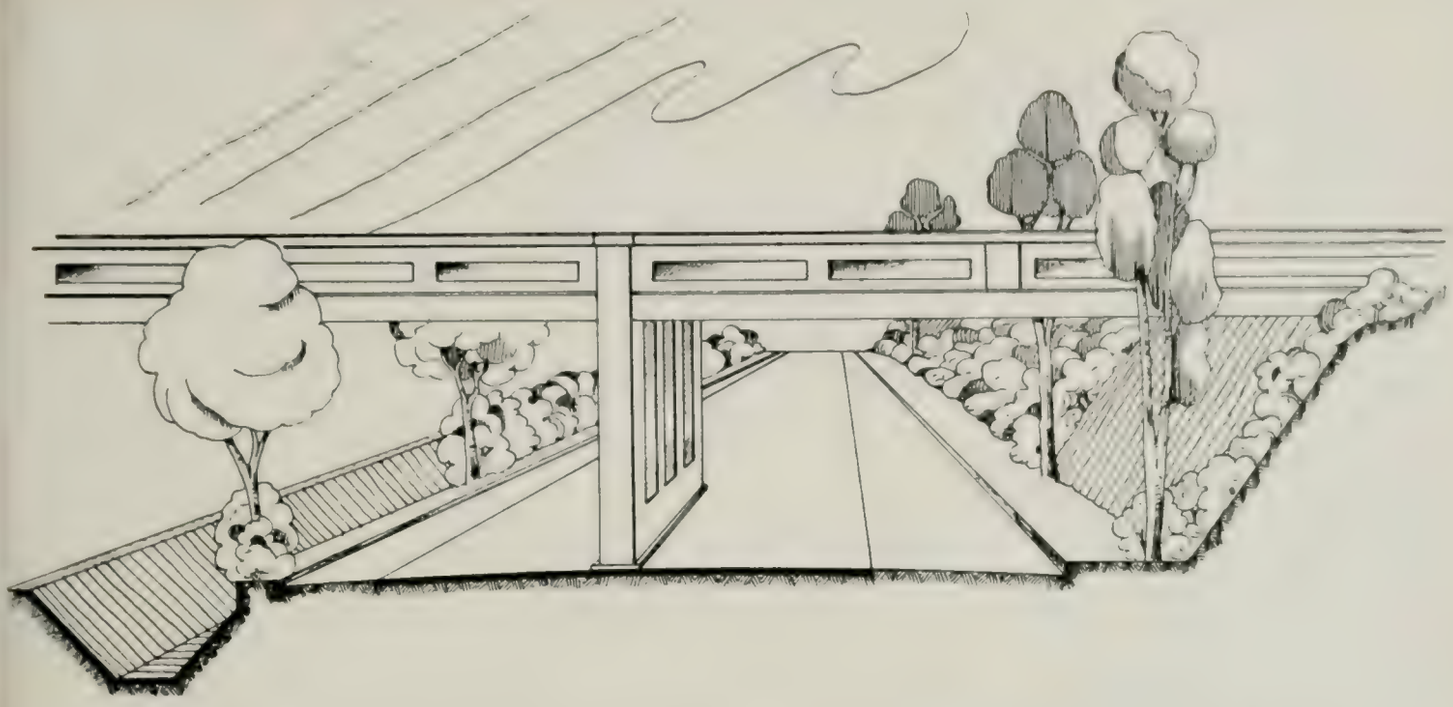
HOW HUGE CABLES WILL BE SPUN FOR BAY BRIDGE

(Continued from page 15)

this automatically results in even stress on each. The first operation is to place in the cable saddles a carefully measured guide wire. The measurements of this wire consist in accurate surveys to establish the desired sag. When the first wire of any strand is spun, this guide wire is placed in the saddles alongside the permanent wire being placed, and the sag of the permanent wire made the same as that of the guide wire. Also, in adjusting the first strands, very careful instrumental observations are made to obtain the calculated sag. Later strands are adjusted so that they have the same sag as the first ones spun.

Cable spinning is scheduled to start shortly after May 15, 1935. After all the 17,464 wires have been laid and bound into 37 strands of 472 wires each, the cable will be squeezed into a true circle, coated with red lead paste, and bound with a spiral wrapping of wire to protect it from the elements.

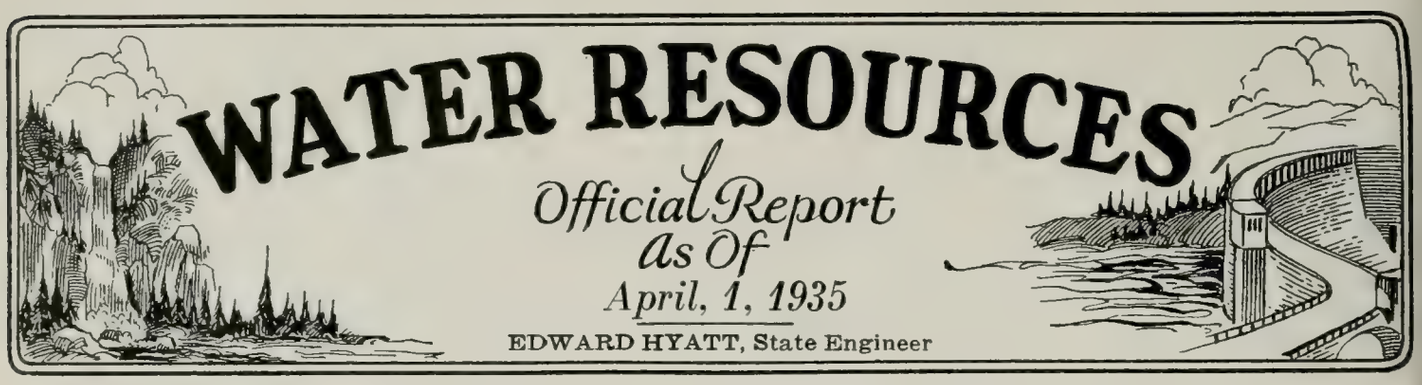
All the cable spinning on the bridge will be accomplished in the year 1935, according to the schedule.



PERSPECTIVE OF TYPICAL DEVELOPMENT AT BRIDGES ON RAMONA BLVD

PERSPECTIVE NEAR MIDWICK COUNTRY CLUB ON RAMONA BLVD.

COYOTE PASS OVERHEAD APPROACH NEAR MONTEREY PARK ON RAMONA BLVD.



At the meeting of The Water Project Authority of California held in Sacramento on March 4, 1935, the executive officer rendered a report reviewing the work done and activities undertaken in connection with the Central Valley Project since August 1, 1934, and in particular for the period from the last meeting of the authority on December 20, 1934. His report sets forth the status of the project in the Federal Public Works Administration, the National Resources Board and the Federal Power Commission, and reviews National and State legislation introduced to effect the early construction of the project.

Surveys are under way for relocation of the State highway and Southern Pacific railroad which will be necessitated by construction of the Kennett Dam. A contract has been entered into with the Southern Pacific whereby the company will make the necessary surveys and estimates of cost for a relocation of the railroad. A field party of the Division of Water Resources has been in the field for some time making topographic surveys to be utilized in relocation studies for the highway and railroad.

Our representatives in Washington are following the project closely and due to the clear and sound presentation of the completeness of the plan, which fully meets the requirements of the President's program, it is receiving the serious consideration of all the committees and Federal agencies interested.

IRRIGATION DISTRICTS

Elections were held in the following irrigation districts and bonds voted to secure RFC loans as follows:

	Amount of RFC loan	*Amount of bonds to be retired*
Merced, Merced County	$8,600,000	$16,190,000
Oroville-Wyandotte, Butte County	402,500	1,095,000
Beaumont, Riverside County	159,000	205,100
Santa Fe, San Diego County	394,500	686,000

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

As a result of several moderate storms occurring during this period, it has been necessary to operate the three Sutter drainage pumping plants almost continuously since February 26th. The streams rose to low flood stage and water passed over all weirs except the Sacramento weir. No damage was caused.

SERA Relief Work

The SERA relief projects under our direction continued during the period, with remarkably little interference by bad weather. The projects for clearing and leveling spoil banks in the American River By-pass were completed. The Butte, Tisdale and Sutter by-passes were covered with water for practically the whole period and no work was accomplished there.

During the period February 16th to March 15th, a total of 24,983 man-hours was worked. The total man-hours of relief labor worked to March 15th are as follows:

	Man-hours
Federal Transient Service, upper Sutter By-pass	6,708
Federal Transient Service, Tisdale By-pass	2,989
Federal Transient Service, lower Sutter By-pass	15,490
SERA Project No. 35-B14-27, American River clearing	61,918
SERA Project No. 58-B14-15, Feather River north of Marysville, construction	44,004
SERA Project No. 58-B14-15, Feather River, maintenance	15,985
SERA Project No. 58-B13-35, Feather River south of Marysville	35,705
SERA Project No. 57-B14-4, Sacramento By-pass	9,472
SERA Project No. 35-B14-222, leveling spoil bank, American River	6,733
SERA Project No. 51-B13-10, Bear River	3,840
Federal Transient Service, seepage canal	630
SERA Project No. 51-B14-39, Butte Slough By-pass	322
SERA Project No. 35-B14-40, Mokelumne River	7,376
Total	211,172

The use of SERA relief labor has been in general very satisfactory. The Reclamation Board today made an allocation of an additional sum of $15,000 to continue the support of SERA projects on flood channel clearing work. To date the cost of carrying these

Flood Waters Spill Over Two Weirs

(Continued from preceding page)

projects has averaged 4.55 cents per man-hour of relief labor, including all costs except powder.

FLOOD MEASUREMENTS AND GAGES

A storm of moderate intensity occurred from February 26th to March 2d, which brought the valley streams to low flood stage, the crest reaching 24.0 feet on the Colusa gage at midnight of March 2d. Water commenced spilling over Tisdale weir at 6 p.m. on March 1st and continued until March 12th, the greatest depth being 2.3 feet, with a measured discharge of 10,553 second-feet. The water spilled over Moulton weir for a short period at a depth of about one foot, and over Colusa weir for about two days with a maximum depth of about two feet. The maximum gage height reached at Knights Landing was 27.5 feet. No water flowed over the Fremont weir. The river at Sacramento crested at 19.2 feet, on March 6th, indicating a discharge of about 50,000 second-feet. This storm was marked by unusually heavy valley rains and heavy rains on the Coast Range mountains.

Another mild storm, also marked by heavy valley rains, commenced on March 6th and lasted about two days. No water spilled over the Moulton and Colusa weirs, but a few inches spilled over the Fremont weir. The maximum gage height at Colusa was 20.4 feet, at Knights Landing 28.0 feet, and at Sacramento 21.1 feet. The maximum flow at Sacramento was about 57,000 second-feet.

At the commencement of the first storm there was 56 inches of snow at Norden, and at the conclusion of the second storm snow had reached a depth of 151 inches.

DAMS

The revised plans and specifications for the construction of the Coyote dam of the Santa Clara Valley Water Conservation District were approved on March 18, 1935. The dam will be a composite earthfill and rockfill structure located on the Coyote River, 100 feet in height and storing 30,000 acre feet of water. It is the main storage dam for the district.

Work on the construction of the Calero dam has been progressing slowly due to weather conditions. Clearing of the site at the Stevens Creek dam is under way and preliminary work at the Almaden dam has been started. Bids have been received for the construction of the Guadalupe dam. These structures are being built by the Santa Clara Valley Water Conservation District.

Placing of the timber facing on the San Gabriel No. 2 dam of the Los Angeles County Flood Control District is progressing.

The repair work on the Los Verjels dam on Dry Creek in Yuba County has progressed. It is expected that the work will be sufficiently advanced at an early date to permit of regulated storage for irrigation use during the ensuing season.

The construction of the Verdugo Wash Debris dam of the Los Angeles County Flood Control District has progressed to the stage where use can be made of the storage. Authorization for the use of the structure was issued on March 18, 1935.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The flow of the Sacramento River at Sacramento increased from 19,000 second-feet at the end of February to 58,000 second-feet on March 9th. Since the latter date, the discharge has slowly dropped to about 32,000 second-feet on March 18th.

On March 10th there were no samples from delta stations showing salinity greater than 7 parts of chlorine per 100,000 and Suisun Bay was practically fresh as indicated by a sample taken at Bulls Head Point showing 10 parts.

Salinity at Upper Bay and Delta Stations on March 10, 1935

Station	*Salinity in parts of chlorine per 100,000*
Point Orient	880
Point Davis	260
Bulls Head	10
O and A Ferry	3
Collinsville	1
Emmaton	2
Antioch	5
Jersey	5
Central Landing	2
Dutch Slough	7
Rindge Pump	3
Middle River	5

WATER RIGHTS

Supervision of Appropriation of Water

During February, 41 applications were received to appropriate water, 10 were denied and 18 were approved. It would appear probable that the filing of applications is being somewhat stimulated by the recent decision of the Supreme Court in the case of Peabody v. Vallejo which affects the validity of many claims by riparian owners which have heretofore been asserted.

WATER DISTRIBUTION

Four new water master districts have been created by order of the State Engineer in accordance with Section 37 of the Water Commission Act; namely, Pine Creek near Alturas and Hot Springs Valley (Modoc County) and Big Valley and South Fork Pit River (Modoc and Lassen counties).

New Nojoqui Grade Road Being Financed With NIRA Funds

(Continued from page 10)

with a bituminous membrane of Grade "E" asphalt to prevent moisture or water percolating upwards into the selected material subbase.

LARGE CULVERT ACROSS CREEK

The roadbed is of the standard 36-foot width and surfacing is 20′x0.75–0.55′–0.55′–0.75′ section Portland cement concrete reinforced at the customary expansion and weakened plane joints, but with no longitudinal reinforcing.

Other features in the contract are the construction of numerous large and special design reinforced concrete box culverts and cattle passes, as well as the construction of a 14 by 16-foot reinforced concrete arch culvert across Nojoqui Creek.

Over the southerly half of the project new construction closely parallels the existing road and the adequate handling of traffic required the construction of several stretches of detour road. These detour roads are 24 feet wide with the central 20 feet made up of selected material surfacing and oil mixed.

This project embraces the most costly per mile piece of construction yet undertaken on the primary highways in District V, the cost approximateing $115,000 per mile.

DISTANCE SHORTENED A MILE

When the work is completed, which is scheduled for September, 1935, the present inadequate road will have been eliminated and the traveling public will have an up-to-date, wide and safe road, free from the congestion and delay of trailing behind trucks with length of travel shortened by almost a mile. This improvement should have a definite influence in encouraging increased traffic on the coast highway.

The project aggregates a total construction cost of about $425,000 financed and governed by the National Industrial Recovery Act, and provides maximum labor from the nearby communities.

The work is under contract, and M. H. Hubbs is Resident Engineer for the State.

Wild: "Do you remember when a girl was proud of having a wasplike waist?"

Wedmor: "I ought to remember it; that was when I got stung."

Grizzly Dome Drops 75,000 Yards of Rock Into Feather River

(Continued from page 4)

large, stained areas indicating old and well defined cleavages. Water also flows from crevices in the broken face. These are the only clues pointing to probable contributing causes of the fracture. There is no certainty that the movement is completed, although the face of the fracture, with minor exceptions, appears as solid and enduring as did the original dome.

A cleavage or fracture of indeterminate depth is known to exist back of the broken face, but until this and other characteristics are examined and interpreted by a geologist, the effect of this possibility of further rock movement on the construction of the highway or on the construction of a dam immediately below are problematical.

Work on the Feather River highway had not yet reached the vicinity of the slide. The nearest operation was work on the portal of a tunnel at Grizzly Creek, some fifteen hundred feet away. This tunnel will be through solid granite unaffected by the slide and not subject to the same influences that caused the large section of the dome to break off.

FRANCE EXPERIMENTS WITH ROSIN RESURFACING MIXTURE

In France the Ministry of Public Works is experimenting with the use of rosin for resurfacing roads. A report of these experiments that have been made in the Department of Landes says:

"Two methods are being observed; one consists of incorporating 5 to 10% of gum in an emulsion of bitumen; the other process utilizes 10% of dark rosin to replace the same quantity of tar in tar emulsions; the experiments being made in the city of Dax and on National Highway No. 10 from Mont-de-Marsan to Dax.

"A definite opinion as to the value of using rosin as an ingredient of the resurfacing material can only be arrived at by prolonged observation after the roads have undergone heavy traffic and bad weather."

Reduced cost, improvement of the anti-skid quality, absorption of a larger quantity of gravel, and a more rapid drying are values claimed for the rosin ingredient.

U. S. TO PROVIDE "WAYSIDES"

Interior Secretary Ickes has just disclosed that part of the $25,000,000 "submarginal land program" fund will be used to provide "waysides" of 20 to 50 acres for use "by the traveler or family groups seeking a day's outing."

Highway Bids and Awards

FOR MARCH

DEL NORTE COUNTY—Between Foot of Oregon Mt. and Oregon State line, 8.7 miles; surface with Cr. Run Base and Seal Coat. Dist. 1, Route 1, Sec. E. Pacific States Construction Co., San Francisco, $92,723; Hemstreet & Bell, Marysville, $66,825; Hein Bros. Basalt Rock Co., Petaluma, $78,222. Contract awarded to E. B. Bishop, Orland, $63,822.50.

GLENN COUNTY—Between 3 miles N. of Willows and Orland; 10.0 miles; Gr. Surf. with Cr. Run Base and Bit. Tr. Cr. Gr. or St.; widen and borders. Dist. III, Route 7, Secs. B and C. C. W. Caletti & Co., San Rafael, $55,979; Hemstreet & Bell, Marysville, $69,905; A. G. Raisch, San Francisco, $69,758; A. Teichert & Son, Inc., Sacramento, $55,947; Hanrahan-Wilcox Corp., San Francisco, $62,924; Peninsula Pav. Co., San Francisco, $61,268; Pacific States Const. Co., San Francisco, $54,866; Chas. L. Harney, San Francisco, $66,116; E. A. Forde, San Anselmo, $63,148. Contract awarded to Tiffany Construction Co., San Jose, $53,084.

IMPERIAL COUNTY—Between East Highland Canal and Sand Hills; 21.0 miles; grade shoulders; Bit. Tr. Scr. Gr. or St. Borders. Dist. XI, Route 27, Sec. A. Griffith Co., Los Angeles, $45,742; V. R. Dennis Constr. Co., San Diego, $58,668; Dimmitt & Taylor, Los Angeles, $49,796. Contract awarded to Oswald Bros., Los Angeles, $45,547.

IMPERIAL COUNTY—3.7 miles east of Brawley, a bridge across Alamo River, eight 19′ timber trestle spans. Dist. XI, Route 187, Sec. C. Miracle Co., San Diego, $13,199; V. R. Dennis Const. Co., San Diego, $14,724; R. E. Hazard Const. Co., San Diego, $14,392. Contract awarded to Parish Bros., Los Angeles, $11,689.

IMPERIAL COUNTY—1½ miles N. of Calexico; 2 bridges and 0.2 mile grade and surface with Bit. Tr. material, road mixed. Dist. XI, Route 26, Sec. J. Parish Bros., Los Angeles, $16,752. Contract awarded to R. E. Hazard Contracting Co., San Diego, $16,568.

INYO COUNTY—Between ¾ mile S. of Nly. Bdy. and Nly. Bdy.; 0.7 mile, grade Sel. Mat. Surf., and Bit. Tr. Dist. IX, Route 23, Sec. F. Gogo & Rados, Los Angeles, $14,430. Contract awarded to Tiffany Construction Co., San Jose, $14,203.50.

LOS ANGELES COUNTY—About 4.25 miles northwest of San Fernando. A reinforced concrete culvert to be extended. Dist. VII, Route 4, Sec. L. A. Tomei Const. Co., Culver City, $9,528; S. M. Milovich, Montebello, $10,259; Geo. J. Bock & Son, Los Angeles, $10,975; Dimmitt & Taylor, Los Angeles, $12,137; J. R. Lippincott, Los Angeles, $13,307; Harry F. Miller, Los Angeles, $14,436. Contract awarded to E. S. and N. S. Johnson, Pasadena, $9,154.

LOS ANGELES COUNTY—In Long Beach and Signal Hill, between Stanley Ave. and Loma Ave., 0.7 mile, grade and P. C. C. and A. C. Pav. Dist. VII, Route 60, Sections L.Bch & Sig. Hill. Griffith Co., Los Angeles, $57,868; Oswald Bros., Los Angeles, $59,784; Geo. R. Curtis Paving Co., Los Angeles, $60,598; United Conc. Pipe Corp., Los Angeles, $66,711. Contract awarded to Sully-Miller Contr. Co., Long Beach, $56,149.80.

LOS ANGELES COUNTY—At Ocean Ave. and Colorado Ave., R. C. Tunnel Arch and 0.2 mile P. C. C. and A. C. Pave. District VII, Route 60, Section S. Mca. M. B. McGowan, Inc., and C. W. Caletti & Co., San Francisco, $185,733; Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland, $195,909; J. F. Knapp, Oakland, $197,850; Bent Bros., Inc., Los Angeles, $196,521; Bodenhamer Const. Co., Oakland, $197,208; Griffiths Co., Los Angeles, $227,478; R. H. Travers, Chas. G. Willis, C. G. Willis & Sons, Inc., Los Angeles, $207,585; Mittry Bros., Const. Co., Los Angeles, 249,701; Bates & Rogers Const. Co., Oakland, $209,967; Mundo Engineering Co., Los Angeles, $206,921; Daley Corp., San Diego, $223,435; Clinton Const. Co. of California, Los Angeles, $206,248; Bannister-Field Co., Fred E. Potts Co., Los Angeles, $196,491; United Conc. Pipe Corp., Los Angeles, $219,670; J. E. Haddock, Ltd., Pasadena, $225,215. Contract awarded to Sharp & Fellows Contracting Co., Los Angeles, $190,723.25.

LOS ANGELES COUNTY—Between Winter Canyon and Los Flores Canyon, 3.4 miles Grade and P. C. C. Pave. Dist. VII, Route 60, Sec. A. Griffith Co., Los Angeles, $127,965; Dimmitt & Taylor, Los Angeles, $123,340; Sharp & Fellows Contr. Co., Los Angeles, $117,535; P. J. Akmadzich, Los Angeles, $117,126; Geo. R. Curtis Paving Co., Los Angeles, $124,058; United Conc. Pipe Corp., Los Angeles, $118,131; Oswald Bros., Los Angeles, $134,305. Contract awarded to L. A. Paving Co., Inc., Los Angeles, $111,222.

RIVERSIDE COUNTY—Across San Jacinto River, 1¾ miles east of Elsinore, bridge consisting of 19–14′ 0″ Conc. slab spans on creos. pile bents. Dist. VIII, Route 77, Sec. B. Byerts & Dunn, Los Angeles, $16,854; Dimmitt & Taylor, Los Angeles, $18,956; V. R. Dennis Const. Co., San Diego, $19,995; Oscar Oberg, Los Angeles, $21,765. Contract awarded to Carlo Bongiovanni, Hollywood, $17,036.08.

RIVERSIDE COUNTY—San Gorgonio Wash. Reinforced concrete girder bridge to be widened. Dist. VIII, Route 26, Sec. C. Paul R. Hughes and Koopman-Wright Co., Long Beach, $7,226. Contract awarded to Matich Bros., Elsinore, $6,831.

SACRAMENTO COUNTY—Between Rio Vista Bridge and Freeport; 0.3 mile. Riprap slope protection. Dist. XIII, Route 53-11, Secs. A-E. Basalt Rock Co., Inc., Napa, $17,615; Hutchinson Co., Oakland, $17,714; Blake Brothers Co., San Francisco, $19,940. Contract awarded to Healy-Tibbitts Const. Co., San Francisco, $17,361.

SAN BERNARDINO COUNTY—Between Riverside Ave. and Colton; 2.0 miles Grade and P. C. C. Pave. Dist. VIII, Route 26, Sec. D. United Conc. Pipe Corp., Los Angeles, $66,641; Mundo Engineering, Los Angeles, $68,070; Griffith Company, Los Angeles, $74,093; Geo. R. Curtis Pav. Co., Los Angeles, $74,064; Sharp & Fellows Cont. Co., Los Angeles, $70,509; Geo. Herz & Co., San Bernardino $70,543; E. L. Yaeger, Riverside, $74,564; Oswald Bros., Los Angeles, $67,942. Contract awarded to B. G. Carroll, San Diego, $64,147.50.

SAN DIEGO COUNTY—Between Emerald Ave. and East City Limits of El Cajon; 0.8 miles; grade and AC. Pave. Dist. XI, Route 12, Sec. E. Cj. R. E. Hazard Cont. Co., San Diego, $39,525; Daley Corp., San Diego, $39,912; Griffith Co., Los Angeles, $43,234. Contract awarded to V. R. Dennis Const. Co., San Diego, $38,999.25.

SAN JOAQUIN COUNTY—An undergrade crossing under A. T. & S. F. Ry. near Stockton. F. Kaus, Stockton, $10,008; John Hachman, Stockton, $11,174. Contract awarded to Lord & Bishop, Sacramento, $8,835.

SAN MATEO COUNTY—Between Thornton and Daly City, 1.7 mile grade and surface with Bit. treated Cr. Gr. or St. on Cr. Run Base, Dist. IV, Route 56, Section E. Union Paving Co., San Francisco $117,345; Healy Tibbits Const. Co., San Francisco, $139,084; The Fay Improvement Co., San Francisco, $123,886; Hanrahan Wilcox Corporation, San Francisco, $119,330; Bayshore Const. Co., Inc., San Francisco, $117,210; C. W. Caletti & Co., San Rafael, $118,265; N. M. Ball, Berkeley, $117,907; Granfield, Farrar & Carlin, San Francisco, $122,094; Chas. L. Harney, San Francisco, $124,597; Fredrickson & Watson Construction Co.-Fredrickson Bros., Oakland, $119,246; A. Teichert & Son, Inc., Sacramento, $133,921; A. J. Raisch, San Francisco, $129,784. Contract awarded to Peninsula Paving Co., San Francisco, $114,834.10.

SOLANO COUNTY—Through Fairfield; 0.7 mile. Grade and Bit. Tr. Cr. Gr. or St. Surf. (plant mix). Dist. X, Route 7, Sec. Frfd. A. Teichert & Son, Inc., Sacramento, $23,679; Chas. L. Harney, San Francisco, $20,760; Ransome Company, Emeryville, $20,187; Unified Contracting Co., Portland, Ore., $22,441; Peninsula Paving Company, San Francisco, $20,194; Lee J. Immel, Berkeley, $22,552; A. G. Raisch, San Francisco, $19,795; E. A. Forde, San Anselmo, $23,199. Contract awarded to Pacific States Construction Company, San Francisco, $19,745.85.

TEHAMA COUNTY—At south entrance to city of Red Bluff; 10 miles grade and Bit. Tr. Cr. Gr. or St.

(Continued on page 32)

Traffic Densities on State and County Systems Reported

CLASSES of traffic carried by the various types of California roads present some interesting comparisons in the motor vehicle transportation survey made by the State Division of Highways.

In a review of this particular phase of the investigation, Director of Public Works Earl Lee Kelly calls attention to the fact that there are three types of highway surface—high, intermediate and low. High includes Portland cement concrete, oiled concrete and asphaltic concrete pavements; intermediate includes bituminous macadam, and metal bases with oiled tops—either sealed, plant mixed or road mixed; and low includes gravel, earth and natural soils either with or without dust oil applications.

THREE CLASSIFICATIONS

Traffic density is designated as light, medium and heavy. Light traffic is less than 500 vehicles per day; medium traffic ranges from 500 to 2000 vehicles a day, and heavy traffic is over 2000 vehicles a day.

On the State highway system, 47.7 per cent of the mileage carries light traffic, 32.8 per cent medium, and 19.5 per cent heavy traffic. Two-thirds of all the light traffic is carried on the low-type surface; practically all the medium traffic on the intermediate and high-type surfaces; and seven-eighths of the heavy traffic is on the high-type surface.

COUNTY SYSTEM FIGURES

On the county highway system, 90 per cent of the mileage carries light traffic; 8 per cent medium, and 2 per cent heavy traffic. Seven-eighths of all the light traffic is carried on the low-type surfaces; three-fifths of the medium traffic is on the intermediate-type surfaces, and one-third of the heavy traffic is on the high-type surfaces. In other words, some 6200 miles of county roads out of a total of 65,130 miles, carry all the medium and heavy traffic for the county road system.

"When I put the ball where I can reach it," said the stout golfer, when asked how he liked the game, "I can't see it, and when I put it where I can see it, I can't reach it."—*Smith's Weekly (Sydney)*.

Restaurant Patron (crossly): "Waiter, what are those black specks in my milk?"

Waiter: "I dunno, suh—unless dey's some ob dem vitimins dey's talkin' so much about."—*Pathfinder.*

Windrow Sizer for Road Mixed Surfaces Developed by Engineers

IN THE construction of oil mixed surfaces by the road mix method, it is essential to secure an accurate spread of material in order to insure a correct proportioning of oil to the volume of material on the road.

One method is to spread a ribbon of road material of uniform thickness on well defined subgrade, but it is rather difficult to ascertain the exact cross-section of such a body of material.

The most acceptable method is to blade the material up into a windrow of as uniform cross-section as possible and then by cutting out a section of known length through the windrow, the weight per lineal foot of material can be determined by weighting this small quantity and the proper amount of oil can be proportioned to the size of the windrow.

DEVELOPED ON JOB

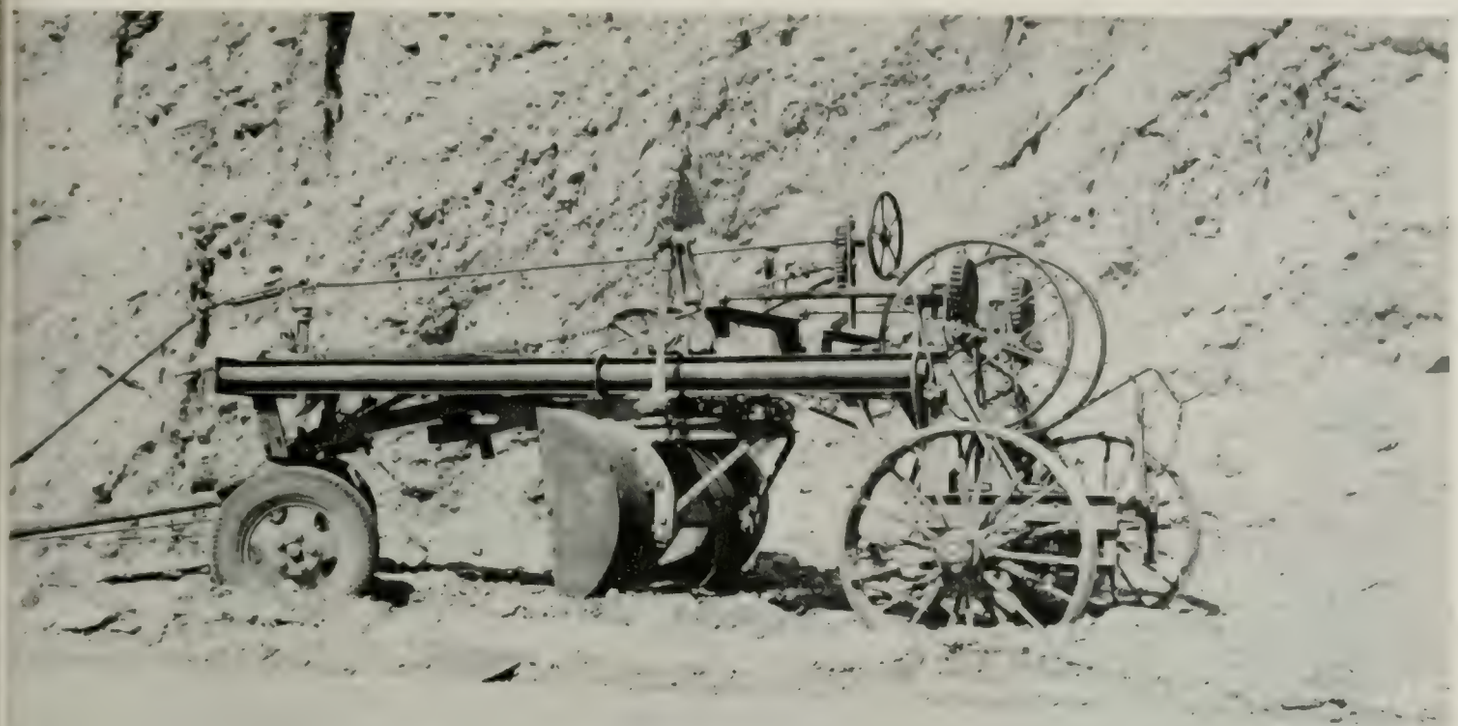
Since it is difficult to blade up a windrow of exact and nonvarying cross-section, various devices have been used by different contractors for accomplishing this purpose. The most recent, perhaps, is the one developed on the surfacing project now under construction between Indio and Shavers Summit in Riverside County.

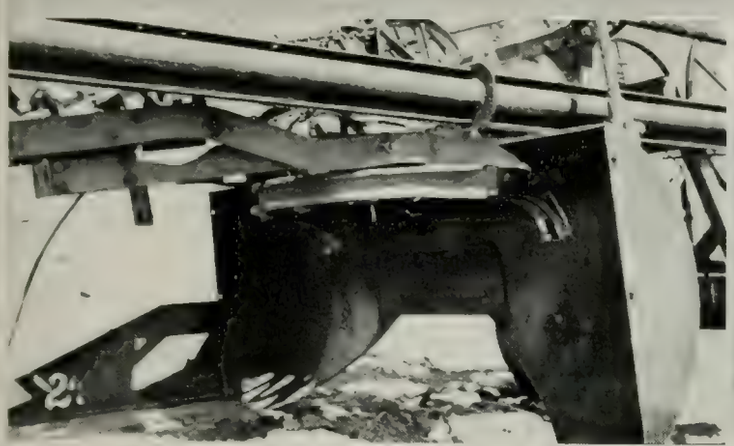
This windrow sizer, as it is called, is the joint development of Resident Engineer Evans and of Gardner Bros., who have the subcontract for mixing the road mixed surfacing.

The equipment consists of a bowl attached to a nine-foot blade grader. The back of the bowl is cut out into an orifice the desired shape of the windrow. At the top of the orifice is an adjustable plate to vary the amount of material deposited in the windrow

On one end of the bowl is a long wing riding on a shoe to clean up the material on one side of the windrow, and on the opposite end of the bowl is a straight opening to permit the excess to roll out to one side only of the windrow.

The excess on the first windrow is deposited on the interior of the roadway to be used in sizing the second windrow. The excess in the second windrow will be spilled on the outer side and swept onto the shoulder with a blade. This is the most promising method of sizing a windrow yet developed.





A MECHANICAL WINDROW SIZER has been invented by engineers on a State job in Riverside County. A blade grader equipped with the sizer is shown in No. 1 and a close-up of the sizer in No. 2. Note adjustable plate at top of orifice. Excess flows out wing on left. No. 3—Blocking out and weighing windrow section to determine percentage of oil. No. 4—Completed windrow showing excess on left.

Car Speeds of Today Demand Large Margin of Safety in Roads

"MAIN highways must be built with an adequate safety factor for speed," declares Frank T. Sheets, former State Highway Engineer of Illinois.

"Modern cars make speeds of 50 and 60 miles an hour effortless, yet in too many cases such speeds are dangerous on obsolete roads with high crowns, narrow widths and sharp curves," Mr. Sheets states.

"A glance backward to the speeds of travel and related design policies of only 15 years ago reveals how far we have come and how inadequate for present traffic conditions are the roads designed then," he said.

"While no one can predict that speeds of 100 miles an hour will become common, nevertheless roads which will supply reasonable safety at that speed are needed to insure adequate safety for present-day common road speeds. Bridges and other structures are built with a factor of reserve strength under the heaviest expected loads. Similarly, highways must be built to be safe at speeds much greater than will be generally traveled.

"People know what the modern motor car can do," concludes Mr. Sheets, "and there is evidence enough that they are not going to be satisfied with highway facilities that seriously limit the capabilities of the car as used by the average driver. That means continued development and modernization of our highway facilities."

HIGHWAY BIDS AND AWARDS FOR THE MONTH OF MARCH

(Continued from page 29)

on creek run gravel base (road mix). Dist. II, Route 3, Sec. B. Hein Bros. Basalt Rock Co. and Sidney Smyth, Petaluma, $19,071; A. G. Raisch, San Francisco, $16,920; E. A. Forde, San Anselmo, $23,804; A. Teichert & Son, Inc., Sacramento, $17,274; Kennedy Const. Co., Oakland, $19,372. Contract awarded to Hemstreet & Bell, Marysville, $16,730.30.

TULARE COUNTY—Between 1 mile and 7 miles E. of Tulare; 6.1 miles Cr. Run Base Borders and Bit. Tr. Surfacing. Dist. VI, Route 134, Sec. B. E. A. Forde, San Anselmo, $21,906; Peninsula Pav. Co., San Francisco, $23,981; Granite Constr. Co., Ltd., Watsonville, $25,930; A. Teichert & Son, Inc., Sacramento, $25,672; Stewart & Nuss, Inc., and John Juckovich, Fresno, $23,810; Basich Bros., Torrance, $23,490; Gogo & Rados, Los Angeles, $20,247. Contract awarded to L. A. Brisco, Arroyo Grande, $19,263.25.

YUBA COUNTY—Widen 7 R. C. bridges between Wheatland and Marysville, Dist. III, Route 3, Secs. A, B. M. B. McGowan, Inc., San Francisco, $39,136; Campbell Construction Co., Sacramento, $53,537; C. W. Caletti Co., San Rafael, $48,916; E. T. Lesure, Oakland, $65,172; Lord and Bishop, Sacramento, $47,490. Contract awarded to M. A. Jenkins, Sacramento, $42,148.40.

In Memoriam

I. S. VOORHEES, who for the past sixteen years has been in charge of maintenance of all State highways in District VII with headquarters in Los Angeles passed away on March 14th at the Pasadena Hospital after an illness of about one week.

Mr. Voorhees was born in New York State in 1872, and graduated in civil engineering from Brooklyn Polytechnic Institute in 1901. He engaged in railroad work as chainman and draftsman until 1903, when he entered the employ of the United States Reclamation Service. He was employed largely on dam and canal design and construction work with this service until 1915, when he went to work for the California Highway Commission as Office Engineer in the Los Angeles District, being changed to District Maintenance Engineer in 1919.

Mr. Voorhees was a hard worker, exceptionally conscientious, and a thoroughly competent engineer. He was a corporate member of the American Society of Civil Engineers and a member of the Phi Kappa Psi fraternity. He was held in high esteem, not only by the engineering and highway organizations but also the general public. His passing will be a distinct loss to the State highway organization as well as to his many friends in that service. He is survived by his wife, Jennie L., and two daughters, Edna Elizabeth and Madeline.

GOVERNOR MERRIAM OPENS AMERICAN RIVER BRIDGE

(Continued from page 19)

on four-foot steel cylindrical piers filled with concrete. It had a roadway width of eighteen feet and was erected at an elevation above that of high water.

DEMOLISHED IN 1914

This bridge served the public for 27 years, when, in 1914, having been found inadequate, it was demolished and a new bridge was constructed downstream about twenty feet. The contract was let for the erection of a patented "Luten" earth-filled reinforced concrete arch bridge for $130,000. It consisted of two 112-foot arches, two 117-foot arches and one 125-foot arch, with four concrete piers and two abutments having wood pile foundations. There was a 21-foot 3-inch roadway with a 4-foot sidewalk on the downstream side and a spindle balustrade on each side.

After a few years use, it became too narrow to accommodate the greatly increased traffic and the roadway was filled up to the sidewalk level and the sidewalk used as a part of the roadway, making it extremely dangerous for pedestrians. It remained in this condition until reconstructed into the present bridge.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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Port of San Jose—Not appointed

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STATE OF CALIFORNIA
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MAP
SHOWING
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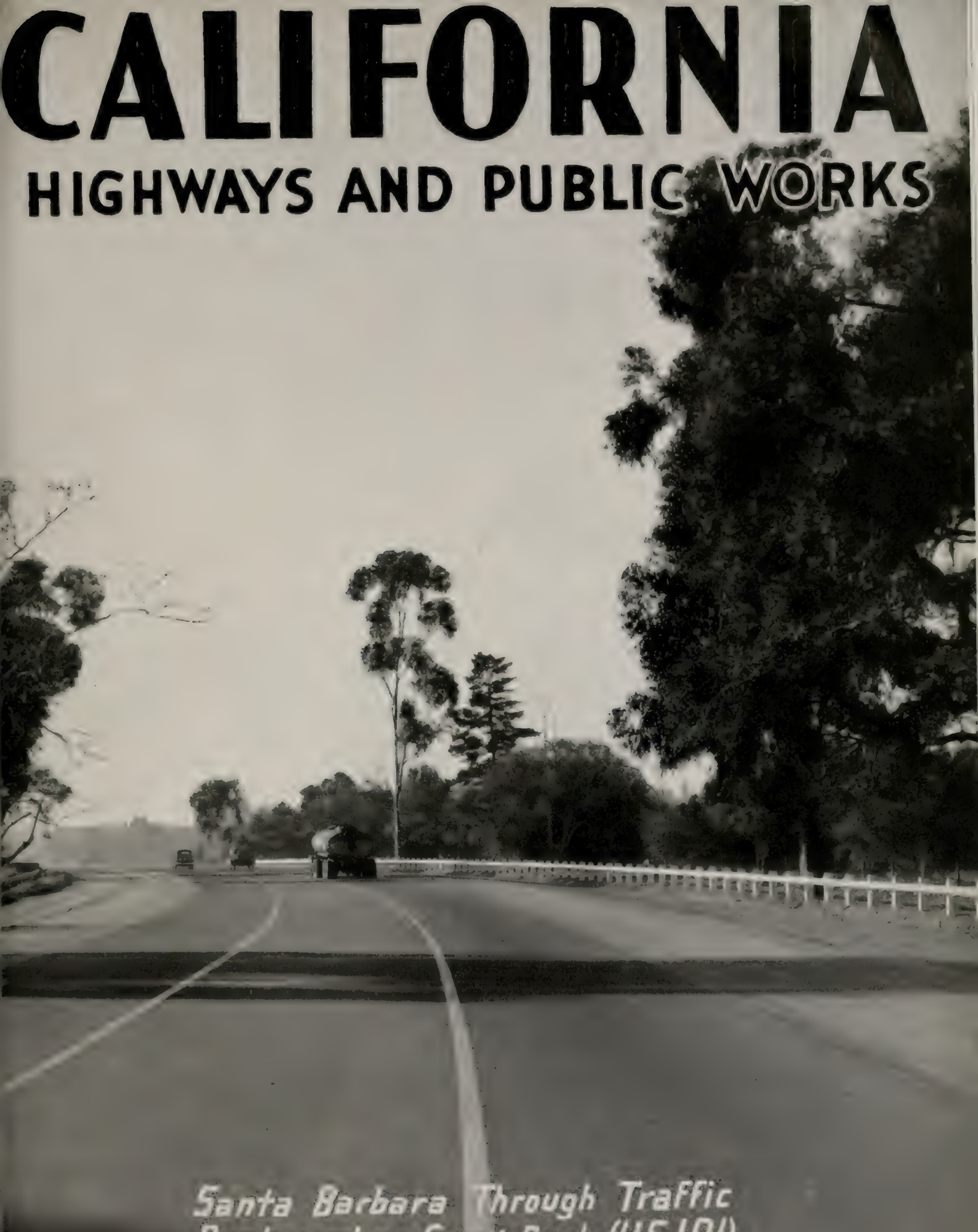
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Santa Barbara Through Traffic
Boulevard on Coast Route (U.S. 101)

Official Journal of the Department of Public Works

MAY 1935

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Gas Tax Diversions Would Stop All Highway Construction for Next 2 Years

Threatened Depletion of State Revenues Will Leave Balance of Only $8,419,000 for Entire State Outside of Cities and Entail Loss of Approximately $20,000,000 of Federal Aid Funds

By **EARL LEE KELLY,** Director of Public Works

SIX MONTHS ago it was predicted in these columns that the incoming Legislature would be urged to pass bills diverting millions of gasoline tax revenue to other than highway purposes, and warning was given that any such diversion would seriously cripple our highway program, resulting in a loss to the State of many millions of Federal aid funds in addition to imperiling our highway investment and throwing thousands of highway workers on to community relief rolls.

That prediction has come true. We are confronting a crisis vastly greater and more serious in its effect upon our highway system than has ever been faced before in the history of this State, entailing, as it does, a complete cessation of all highway construction for the next two years.

EARL LEE KELLY

As this issue goes to press, the State is threatened with a loss of $19,984,000 of gasoline tax and motor vehicle fee funds, out of an estimated total of $51,800,000 for the ensuing biennium, through allocation and appropriation of an additional ¼ cent to city streets and a proposed diversion of funds for bond interest and other governmental functions.

In addition, as a result of such diversion, the State may lose directly and indirectly approximately $20,000,000 of available Federal aid funds, out of a possible total of $36,859,000.

Considering the State highway revenues alone, after deducting cost of administration and maintenance, diversion bills now before the Legislature would leave a balance of only $8,419,000 of highway funds for the entire State outside of cities.

This sum, as divided by law between the North and the South, would provide but $2,289,968 for use on primary roads in the North and $1,919,532 for primary South.

Of the $2,289,968 primary North there is obligated by State law and contract with the Federal government the sum of $3,300,000 for approaches to the San Francisco-Oakland Bay Bridge. A deficit of more than $1,000,000 would have to be taken from secondary North, leaving approximately $1,100,000.

Of this balance $300,000 is obligated by Joint Highway District law on contracts for the low level tunnel between Alameda and Contra Costa counties, Joint Highway Dis-

(Continued on page 10)

MAY 25 1935

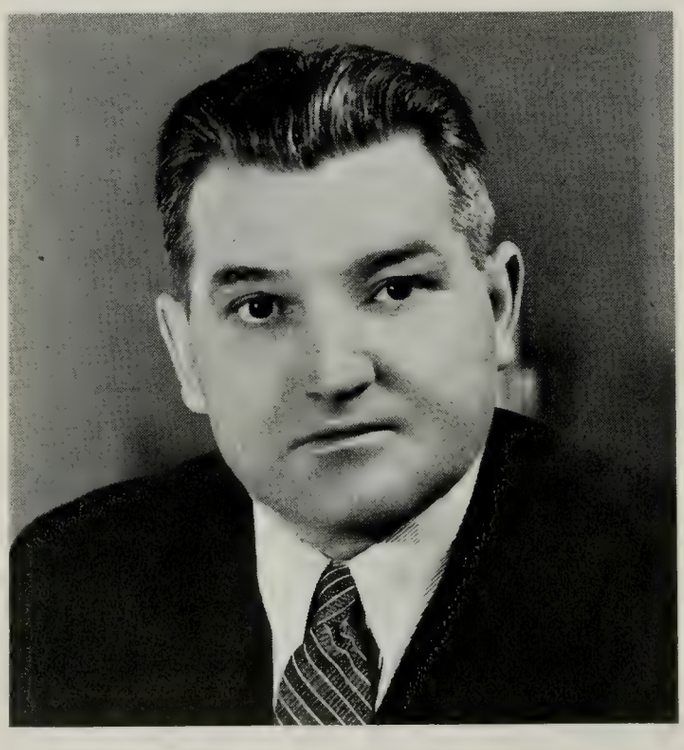
"California at Work" Motif of Great State Display at San Diego Exposition

By **EDWARD J. NERON,** Deputy Director of Public Works

CALIFORNIA goes back to its "cradle" this month to picture its progress and development at California Pacific International Exposition, opening May 29 in San Diego—birthplace of the State's civilization.

International in scope, the world will visit the "City by the Silver Gate" to appraise "California at work" which is the general motif of the display in the spacious exposition palace dedicated to the Golden State.

The new State Building recently completed with PWA funds and SERA labor is 228 feet long and 118 feet wide and has a floor space of approximately 27,000 square feet, in which to house the State's exhibits, to be gathered and erected under administration of the State Department of Public Works.



EDWARD J. NERON

To provide for a fine, comprehensive display of California at work, the present Legislature has supplied the Department of Public Works with a fund of $75,000 to be administered under the direction and supervision of Director Earl Lee Kelly, who has appointed Adolph Muehleisen as State Commissioner in charge of the State Building and exhibits.

The California State Building, an architectural triumph in combining early American Mayan and Aztec style with modern construction, is situated at the southwestern corner of Palisades plaza, around which are constructed a $2,000,000 Ford Building, a beautiful Palace of Education, Palace of Movies, a gigantic Transportation Building, Federal Building and Standard Oil Company's structure.

HANGING GARDEN DECORATIONS

A feature of the facade development of California's building is the hanging garden treatment. The main entrance from the plaza side will show four great murals, picturing scenic grandeur of the State, agricultural development, commerce and natural resources. The murals are the work of Juan Larrinaga, art director of the exposition.

Of the approximate 27,000 square feet of exhibit space in the State Building, 17,000 square feet is allocated to county exhibits and 10,000 square feet to State departmental displays.

Development of the State Building exhibits according to the general theme of "California at Work" is under direction of Orville Goldner, who is also supervising work of the Palace of Education. Mr. Goldner, an authority on art technique of the theatre and screen, is noted for his creative genius in the production of great movie spectacles, having been associated with large studios for many years. He was also art and technical director of the Shakespeare Guild of America and is instructor in technique of the theater at Stanford University summer school. He is a graduate of the Museum School of Design, Toledo, Ohio, and California School of Arts and Crafts.

HUGE RELIEF MAP FEATURE

Under his direction a great relief map of California, 120 feet long and 12 feet wide, has been made to form the central division of the building and around and under the map will be developed the various departmental

(Continued on page 24)

STATE BUILDING AT SAN DIEGO EXPOSITION is a combination of early American Mayan and Aztec style of architecture with hanging garden decorative treatment of facades. The structure is 228 feet long by 118 feet wide and has 27,000 square feet of floor space. Below are shown two of the four great mural panels picturing the agriculture, commerce and natural resources of the State that adorn the sides of the main entrance to the building from the plaza. State and county exhibits will divide the floor space with numerous working models giving realistic portrayals of important activities.

Progress on M Street Bridge at Sacramento Promises Opening in Fall

By **W. A. DOUGLAS,** Assistant Construction Engineer of Bridges

IN 1910 the Sacramento Northern Railway Company constructed a through steel truss railway bridge across the Sacramento River connecting Sacramento and Yolo counties at the foot of M Street. With financial assistance from these two counties the bridge was provided with narrow roadways and sidewalks cantilevered out from the frames. The bridge was built with a swing span to accommodate river traffic. The operation of the swing span was slow and involved a considerable loss of time to vehicular traffic desiring to use the bridge.

In spite of the restricted roadways and delays due to slow operation, the bridge has served traffic, carrying the majority of travel between Sacramento and the San Francisco Bay region, the Redwood Highway and the West Side Highway to the north for 25 years. During the early part of this period the capacity of the two roadways was well in excess of the demands placed upon it. However, with the increase in density and speed of automobile traffic during the last 15 years thoroughfares which appeared broad and highly satisfactory prior to 1920 have become entirely too narrow and cramped for safe, comfortable travel.

Civic pride, too, had a hand in hastening the obsolescence of the 1910 bridge. With the bulk of passenger travel switching from rail and water to highways it has become increasingly important that an attractive as well as adequate highway entrance to the State's capital city be provided.

FOUR GOVERNMENTS COOPERATE

The pressure of local demand and highway necessity finally culminated in the provision of funds by the city, county, State and Federal governments in 1933 followed immediately by the necessary studies, preparation of agreements with interested and affected parties and the preparation of plans and specifications leading up to the advertising of the work June 1, 1934. An enlightening discussion of the multitude of problems and difficulties encountered in the preliminary stages of this project can be read in an interesting article entitled "New M Street Bridge at Sacramento to be under construction in the spring," written by F. W. Panhorst, acting bridge engineer, which appeared in the January, 1934, number of this magazine.

On June 27, 1934, eight proposals for the construction of the new M Street Bridge were received by the Division of Highways. The totals of the proposals ranged from the high bid of $1,025,224 down to the low bid of $907,365. Award was made on July 14 to the low bidder and the contract was duly approved on July 31.

Work began immediately on preparations to excavate for and pour the concrete river piers and to construct the temporary railroad shoofly trestle. The contractor's principal concern during the fall was the completion of the river piers before progress should be hampered by winter rises in the river level.

FOUR COFFERDAMS DRIVEN

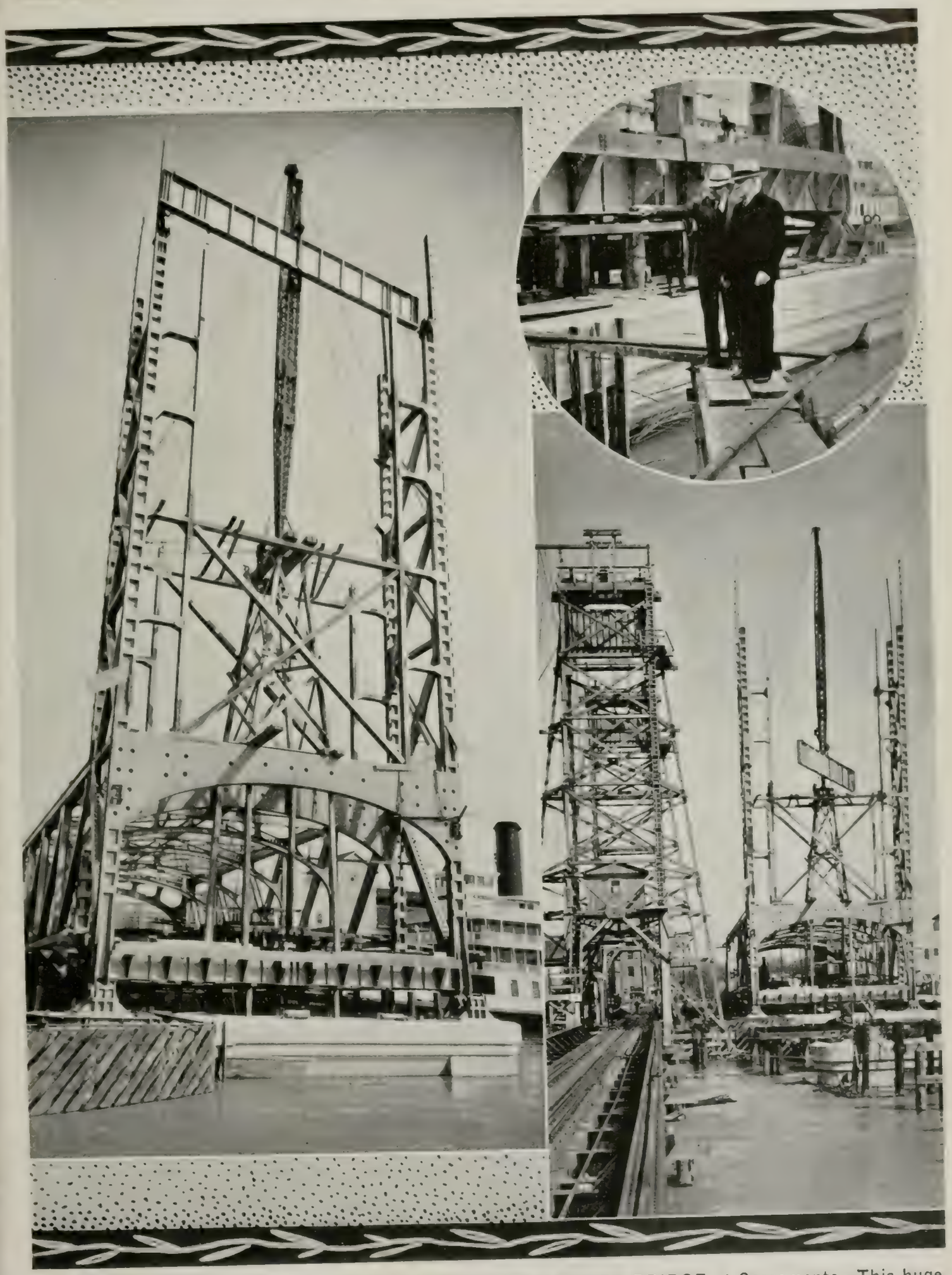
Plans required that excavation for these piers be carried down through the silt, sand and gravel of the river bed to suitable foundation at elevation —50, or approximately 55 feet below the summer level of the river. To accomplish this work the contractor, after first predredging the pier sites, set up and drove 60-foot steel sheet pile cofferdams. Four of these deeper pier footings were required—two each for the two main or rest piers.

Due to interference with the operation of the swing span of the old bridge only two diagonally opposite cofferdams could be driven simultaneously. No unusual difficulty was encountered either in driving the cofferdams or excavating.

To balance the hydrostatic pressure it was necessary to pour a concrete seal approximately 24 feet in thickness in each cofferdam before the water could be pumped out. Each of the four cofferdams was about 30 feet in diameter requiring for the seal alone nearly 650 cubic yards of concrete. Five transit-mixers were used and each of the four seals was placed by continuous pouring from 18 to 22 hours.

With tight seals in place each cofferdam could be pumped readily and the piers com-

(Continued on page 18)



CONSTRUCTING EASTERLY LIFT TOWER OF M STREET BRIDGE at Sacramento—This huge steel structure has now been built to practically its full height which will be about 200 feet above low water. Inset shows Governor Frank F. Merriam inspecting massive bearings of the lift tower. Below, a view of the temporary wooden detour bridge and a derrick lifting one of the new tower girders into position.

Sacramento Flood Control Project Proved Efficiency During April Storm

By **R. L. JONES**, Deputy State Engineer

A VERY convincing demonstration of the efficiency of the Sacramento Flood Control Project occurred last month when following a week of intermittent showers, a storm of fair intensity developed over the Sacramento Valley and the Sierra Nevada watersheds, commencing on April 6th. The rainfall was heavy in the valley areas and in spots in the mountain and foothill watersheds, but was not sufficiently sustained to produce a serious flood.

The resulting stream flows reached only medium flood stages, with few exceptions. Generally, the flood was about one-quarter of the maximum flood for which the Sacramento Flood Control Project is designed, although some of the channels carried a greater proportionate flow. No completed part of the project was endangered.

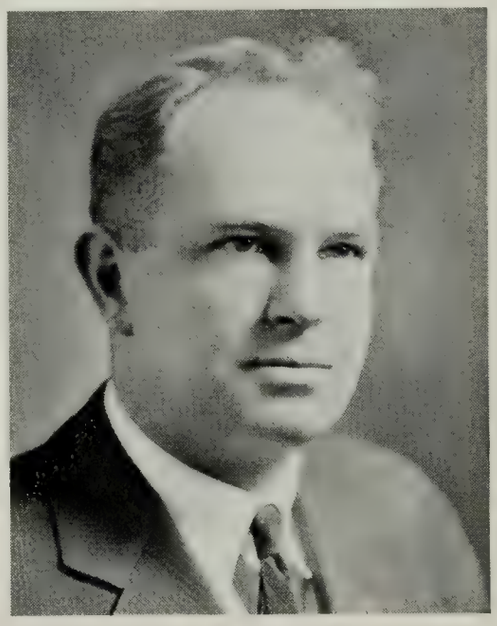
Rainfall commenced on the afternoon of April 6th and continued though April 8th. Precipitation was not especially heavy on the upper Sacramento River watershed, but was fairly heavy, although spotted, on the Feather, Yuba and American River watersheds, reaching almost cloudburst proportions on the lower Bear River watershed and adjacent foothill areas.

The precipitation in the mountains above the 5000-foot elevation was practically all snow. Throughout, the rainfall was of short duration and was not preceded by preparatory rainfall, so that conditions necessary to produce a major flood were absent.

The rainfall in the city of Sacramento was unusually severe, breaking several records as to rate of fall. A total of 3.19 inches fell on Sunday, April 7th. Many streets were flooded for short periods and the city drainage system was severely overtaxed. However, no serious damage was done, although a few basements were flooded.

Rainfall at Representative Stations
(For 24-hour period ending at 7 a.m.)

Name	April 7	April 8	April 9
Delta	1.25	1.74	.06
Dunsmuir	.67	1.60	T
Kennett	1.32	1.68	1.06
Red Bluff	.80	.64	.12
Knights Landing	.41	1.34	.14
Quincy	2.00	.03	--
Oroville	.90	.82	.24
Folsom	.44	2.00	1.02
Sacramento	.37	3.19	.21
Placerville	--	2.42	.23
Colfax	.62	3.90	.15
Grass Valley	2.63	1.80	.08
Blue Canyon	2.53	1.98	.04



R. L. JONES

The total storm rainfall was light compared with that of 1928. The March 1928 storm covered a period of six days, with total precipitation as follows: Kennett, 6.94 inches; Quincy, 9.80 inches; Nevada City, 12.70 inches; Placerville, 10.90 inches; Blue Canyon, 14.40 inches; Oroville, 4.82 inches.

The stages reached in the various river and flood channels were not excessive and, except in a few instances in relation to uncompleted levees of the project, resulted in no dangerous conditions and need-not have caused alarm. The heights reached by the water at various points are given in the table below:

Water Surface Heights

Station	Time of crest	Gage height	Flood height
Colusa	8.30 a.m., April 10th	25.1	30.3
Tisdale weir	5.00 p.m., April 10th	48.2	53.0
Knights Landing	11.30 a.m., April 10th	30.2	34.6
Folsom	8.45 a.m., April 8th	18.8	--
Sacramento, I St.	5.00 p.m., April 8th	28.6	31.3
Verona	All day on April 9th	35.8	41.8
Marysville	7.00 a.m., April 9th	17.3	26.2
Nicolaus	1.30 p.m., April 9th	20.5	28.1
Sacramento weir	6.00 p.m., April 8th	32.6	34.5
Lisbon	7.00 p.m., April 10th	17.3	26.2

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FLOOD SCENES NEAR SACRAMENTO—At top, squatters' cabins in American River overflow area. Center—Aerial photograph showing confluence of swollen Sacramento and American Rivers with the city of Sacramento protected by levees and Yolo By-Pass from any extensive damage by flood waters which only reached low, overflow areas in environs. Below, scene along American River at 12th Street Bridge showing State highway through North Sacramento partially submerged.

Hydraulicking Highway Cut Through Mountain Costs 2.26 Cents Per Yard

By **WALTER B. LITTLE**, Acting Resident Engineer

WHEN the Highway Commission on April 29, 1932, authorized the construction of the road between Weaverville and Junction City, on State Highway Route 20, in Trinity County, an engineering investigation was made of the conditions to be encountered and it was decided to excavate a huge roadway cut through the summit of Oregon Ridge by hydraulic means, as an economical and sound procedure.

The existing road passes over Oregon Ridge, to the south of the selected route, with grades in excess of 15 per cent and curves of short radii.

As the use of hydraulic methods is a departure from usual procedure in excavation for highway construction, the conditions encountered have proved of interest in the solution of many and varied problems.

METHOD PROVEN SUCCESSFUL

In this particular case, the first year's operation has thoroughly demonstrated the success of this method of excavation where the lay of the land and the availability of a water supply furnish the fundamental principles justifying such a step.

During the first nine months of actual operation of the hydraulic plant, 1,557,000 cubic yards were excavated at a cost of only 2.7 cents per cubic yard, or less than one-tenth the cost of excavating by ordinary methods and the total for 11 months was 2,481,000 yards at a unit cost of 2.26 cents per cubic yard.

At the head of Oregon Gulch, on the west of the ridge, is the mine pit of the La Grange Mining Company, formerly one of the largest hydraulic gold mines in the world, but idle for many years. This pit, once a hill but now a shallow hole covering 300 acres, is bounded on the east by the summit of Oregon Ridge, which drops off precipitously for 100 feet in elevation to the surface of the loose gravelly debris in the pit; while on the west, Oregon Gulch slopes gently down to its junction with the Trinity River.

To the south is a ragged, broken country unsuitable for road location; but on the north of the pit is a steep, smooth plane of bedrock, upon which it is proposed to locate the highway.

MASS IS SLIDING

In the area where this north rim joins the summit ridge, comprising some 35 acres, is a mass of heterogeneous debris, varying from 50 to 150 feet in depth. Continuing a movement started years ago by the operations of the La Grange Mine, this mass of material is creeping across the line of the proposed road at a rate of one and one-half feet per month, which required its removal, estimated at 3,000,000 cubic yards.

Fortunately, this slide is composed of soft material, such as sand, fine gravel, finely crushed bedrock and clay seams and masses. The ridge proper, as discovered through geologic investigation, is also composed of such materials as stratified gravel, clay and boulders, though considerably harder than the material of which the slide is composed. This formation is at least 300 feet deep. Both formations, however, are suitable for excavation by hydraulic means; and the material in the sliding mass is ideal for that purpose.

OLD EQUIPMENT LEASED

The greatest handicap in most hydraulic undertakings is the heavy expense involved in the preparation for actual operation, in the construction of canals, pipelines, flumes, and in the acquisition of water rights. The La Grange Mining Company had, and was willing to lease, hydraulic equipment of all kinds, a dumping ground for tailings in Oregon Gulch, and a water supply system which could provide water by gravity for the operation of the hydraulic monitors.

All that was necessary was for the State to repair and supply conduit, eleven miles of flume ditch and pipe line tapping East and West Weaver creeks; build a reservoir for regulation of the water supply; install short service flumes, ditches, pipe lines and giants for the control of the water; and finally to turn on the water and start digging.

The proposed roadway cut through Oregon Ridge is a large excavation project involving a cut having a possible depth of 280 feet, a

(Continued on page 16)

HYDRAULIC GIANTS AT WORK on Oregon Mountain. In circle, at top, giant is operating on 150 foot embankment below summit. Center is close-up of giant undermining ridge. At bottom, view of valley showing area being sluiced to bedrock. Stream at left is tailings from giant operations. Existing highway is seen crossing stream. Dotted lines indicate route of proposed highway.

State May Lose All Federal Aid Funds

(Continued from page 1)

trict No. 13 which is a cooperative project now in course of construction.

Therefore, there will remain not one cent for State highway improvement or construction on the primary State highways in the 45 northern counties.

There will remain only about $800,000 for expenditure on the secondary State highways in the 45 northern counties.

In the southern 13 counties there will remain $1,919,532 for primary State highways and $2,104,750 for secondary highways, a total of $4,024,282 for the biennium.

$5,880,000 TO GENERAL FUND

In addition to the allocation of an additional ¼ cent to city streets other than State highways amounting to $5,812,000 and bond interest and redemption of $8,104,000, as proposed in bills before the Legislature, the State comptroller has announced it will be necessary within the next few weeks to conscript, under constitutional mandate, approximately $5,880,000 from gasoline tax revenues for general fund purposes.

The results of such proposed legislative diversion upon the Federal aid funds coming to the State are as follows:

The Federal government, by the Hayden-Cartwright Act of June 18, 1934, has established the principle that State highway revenues derived from gasoline taxes, motor vehicle registration fees, licenses, or other motor vehicle taxation must be devoted exclusively to highway purposes, if the states desire to continue to receive their full share of Federal appropriations.

The Federal Statute provides that any State which diverts any portion of its highway revenues derived from taxation of highway users for nonhighway purposes after June 18, 1934, will immediately be deprived of one-third of all regular Federal aid highway appropriations.

FEDERAL AID LOSSES

The Division of Highways envisages the results of the adoption of this policy upon Federal aid as follows:

Immediate loss of one-third of all regular Federal aid for the next two years, amounting to $3,200,000.

Probable loss of one-third of the emergency Federal aid to be appropriated under the President's present work program, amounting to $9,100,000.

The amounts thus taken away may make it impossible for the State to match the balance of the regular Federal aid for the next two years, in which case the whole of such aid will be lost, amounting to an additional $9,585,000.

It is probable that the proposed Federal grade separation program for California can not be undertaken.

NO FUNDS FOR COSTS

While funds to be apportioned under the President's program need not be matched with State funds, numerous items of the cost of such projects, such as right of way, property damage, engineering, etc., have not heretofore been payable from Federal funds, and State funds must be available for such purposes or the Federal moneys are not forthcoming. Lack of necessary State funds would result in the loss of $10,000,000 of emergency Federal money, in addition to the losses hereinbefore listed.

The net result of all these proposals will leave the State virtually without funds for new construction for the next two years.

Available revenues and the effects of the proposed legislation upon them are shown in the following tabulation:

STATE HIGHWAY REVENUES:		
Gas Tax	$46,500,000	
Motor Vehicle Fees	5,300,000	
Total		$51,800,000
Expenditures required for maintenance and administration:		
Administration	$2,558,000	
Maintenance	15,215,000	
¼ cent to cities (present law)	5,812,000	
Total		23,585,000
Balance—State Highway Funds		$28,215,000
¼ cent to city streets other than State highways (now pending)		5,812,000
Balance—State Highway Funds		$22,403,000

General Fund Conscription $5,880,000

(Continued from preceding page)

Diversions from State highway purposes:	
Conscription for general fund	$5,880,000
Balance—State Highway Funds	$16,523,000
Bond Interest and redemption 87th–88th fiscal years	8,104,000
Balance—State Highway Funds	$8,419,000
FEDERAL AID APPROPRIATIONS:	
Regular Federal aid (Hayden-Cartwright Act of 1934) which has to be matched with State funds	$9,585,000
Maximum possible emergency Federal aid for highways and grade separations, 1935 appropriation:	
Highways	$15,892,000
Grade separations	11,382,000
Total possible emergency Federal aid	27,274,000
Possible total all Federal funds	$36,859,000

Federal regulations do not permit Federal funds being expended for rights of way or property damage, and only those engineering costs chargeable to engineers actually employed on the project. Past experience shows that rights of way costs average ten to twelve per cent of the cost of the project; also that engineering costs not reimbursable from Federal funds average five per cent of the cost of the project. There are also marginal construction items such as cattle passes, fences, irrigation structures, and the like, which the Federal government will not pay for, which amount to at least five per cent.

STATE LACKS $15,500,000

It will require at least $10,000,000 of State funds to match the regular Federal aid.

It will require at least $5,500,000 of State funds to handle the emergency Federal aid program.

Secondary highways added to the State highway system in 1933 need at least $2,500,000 for minor improvement, such as oiling, surfacing, drainage, etc., which is not eligible for Federal aid.

The above facts have all been presented to the State Legislature by the Department of Public Works, and it is hoped that despite the pressing financial problem we are facing in an effort to balance the State budget, the legislators will not find it necessary to make these very costly diversions from the State highway revenues, not only from the financial standpoint of crippling the continued orderly highway construction program which has meant so much in the development of our State in the past, but also the resultant effect of depriving thousands of men of useful gainful employment thereby increasing the unemployment list in every county of California.

Researchers Extend Roadside Development

The Joint committee on Roadside Development of the Highway Research Board and the American Association of State Highway Officials has found and maintains that practical roadside development when accomplished in accordance with approved principles of Landscape Engineering contributes to the economy, efficiency and safety of highway maintenance and operation.

In support of this statement the following factors are presented:

1. Stabilization of slopes reduces erosion.
2. More adequate drainage is provided.
3. Drifting snow, sand and dust is in part controlled.
4. Traffic hazards are greatly reduced and guard rail costs decreased.
5. Cost of mowing roadsides is reduced.
6. Land and property values are enhanced.
7. Land damage claims are lessened.
8. Better public relations are promoted.

In addition to the above factors which elevate standards of efficiency, safety and economy and the many important considerations of increased utility and esthetic enjoyment, the committee makes the following recommendations:

Close collaboration between all State planning boards and administrative agencies controlling highways, parks, reservations and other recreational areas.

In order to stabilize land values, promote safety and convenience and insure a more permanent and attractive countryside, the vital importance and value of the accepted principles of urban zoning should be studied and adjusted for practical application to all rural highways and parkways.

Bay Bridge to Have 16 Toll Stations All Located on the Oakland Approach

AUTOMOTIVE traffic over the San Francisco-Oakland Bay Bridge will be expedited by the operation of sixteen toll collection stations located near the eastern end of the bridge.

Designs for the toll houses and an operations building modeled along the most modern lines have been approved by Chief Engineer C. H. Purcell. The complete structure will be erected on the fill in the Oakland tidelands which will constitute the east-bay approach to the bridge.

The operations building, located on the north side of the approach roadway, will contain a garage, machine shop, electric controls, police station and general bridge maintenance office.

Beneath an overhead structure extending across the roadway from the main building will be sixteen toll collection stations, fourteen to accommodate passenger automobiles and two for trucks, with an equal number of traffic lanes. Two collectors are to be stationed in each of the eight houses.

Trains will approach and leave the bridge on tracks passing behind the operations building at the extreme north side of the approach.

PAVING EASTERN APPROACH

Contractors are pushing operations on the east bay superstructure of the bridge and on Yerba Buena Island. While paving still is in process at the eastern approach to the bridge, contractors are getting under way with the erection of the west anchor of the cantilever span over Army Point on Yerba Buena. At the other end, Span E-6 now is sixty per cent complete. This is the third of the 508-foot railroad type spans to be started.

Far inside Yerba Buena, miners have bored ribs down from a crown tunnel to two side tunnels and placed forty I-beams in these lateral drifts. For twenty feet, steel lining has been placed on top of the I-beam ribs, and the space between these plates and the rock roof has been packed with broken rock.

CATWALK ROPES ERECTED

The work of concreting this loose rock above the steel, all of which later will be encased in concrete, has just been started. Between the east portal of the tunnel and Pier YB-1 three additional spans of concrete upper deck roadway have been completed.

Construction is progressing rapidly on the west bay superstructure. With all the catwalk ropes in final position between the San Francisco anchorage on Rincon Hill and Tower W-2, the work of raising bundles of catwalk flooring to the top of the tower is going forward.

At the center anchorage, Pier W-4, the A-frames, to which will be tied the suspension cables supporting the twin bridges, have been erected. Concreting to the level of the lower deck is under way and the third week of May saw the placing of catwalk ropes between Tower W-3 and the center anchorage.

VIADUCT STARTED

Erection of the Yerba Buena Island cable bent has been completed save for riveting.

Construction of a huge inverted concrete box east of Fifth Street in San Francisco as the start of the long viaduct which will bring the bridge down to grade has been begun.

Work on the great transbay bridge now has reached the stage where each week's progress is plainly apparent to ferryboat commuters and sightseers.

ENGINEER LOCATES GRAVEL DEPOSITS BY ELECTRICITY

An engineer of the State Highway Department, has developed a method of locating buried gravel deposits by means of electricity, says the Minnesota Highway News.

His method has proved more economical and satisfactory than the old system of locating gravel by drilling test holes, highway department officials assert. By this method electric currents are sent through the earth and by measuring the electrical resistance encountered, the engineer determines what is beneath the surface.

California grade-crossing accidents killed 161 persons in 1784 accidents last year. This is about a 3 per cent decrease from the 169 killed in 1847 accidents in 1933.

BAY BRIDGE TOLL HOUSES numbering 16 will be located beneath an overhead structure extending from the large operations building straight across the wide roadway at the Oakland end of the bridge. Traffic will be accommodated in 16 lanes, 14 for passenger vehicles and two for trucks. The operations building will contain a garage, machine shop, electric controls, police station and maintenance office.

AERIAL VIEW of the East Bay structure and the Oakland approach fill as constructed to date showing the fourteen 288 foot steel spans and Span E–8, the first of the five 500 foot cantilever spans already erected. A traveling derrick is erecting the second 500 foot Span E–7. The Maltese cross indicates the location where the 16 toll collection stations will be erected on the wide fill extending across the flats from the Oakland shoreline.

By-Pass Channel Relieved River

(Continued from page 6)

Very little water was flowing in the by-passes, the Sacramento River from Knights Landing upstream was five feet below flood stage, the Feather River was eight feet below flood stage, and the Sacramento River at Sacramento was three feet below flood stage.

All of the weirs of the Sacramento Flood Control Project are now completed, except the outfall gates at Butte Slough. The project is so designed that the Sacramento River shall carry a maximum quantity of water in the river channel itself at all times, to be relieved into the by-passes over the weirs when the water approaches a dangerous stage. The weirs, therefore, have the effect of causing rather high stages in the Sacramento River even during small floods such as that of last month.

This flood is the first one occurring since the completion of the Moulton and Colusa weirs and the raising of the crest of the Tisdale weir, and it is therefore the first time that the river has acted as intended under the flood control project.

Heretofore the river has had relief into the by-passes at lower elevations, but the new condition of higher river stages will exist during all future floods. It will be further increased to some extent by the completion of the Butte Slough outfall gates this summer.

In future floods, even small ones, the water stage in the Sacramento River at such stations as Colusa, Knights Landing and Sacramento will approach within a few feet of the flood height and will be held to these stages for longer periods. This is the manner in which the project is intended to function and need cause no alarm, provided the levees are maintained in good condition.

It is estimated that the peak or crest discharges during this flood were as follows:

	Second feet
American River at Fair Oaks	70,000
Sacramento River at Colusa	49,800
Sacramento River at Verona	67,000
Sacramento River at I Street	95,000
Bear River at Wheatland	35,000
Moulton weir	11,500
Colusa weir	23,200
Butte Slough	14,500
Tisdale weir	13,300
Fremont weir	67,300
Sacramento weir	12,000
Yolo by-pass at Dixon Ridge	60,000

During this flood the by-passes were required to carry relatively little water, the bulk of the drainage passing down the main Sacramento River channel. Had the flood been larger, the additional water would have been carried in the by-passes with safety. It was not necessary to open the gates of the Sacramento weir, although approximately 12,000 second feet was discharged over the crest at a depth of 1.65 feet.

The peak quantity passing the latitude of Sacramento was approximately 155,000 second feet, or 26 per cent of a project quantity flood of 590,000 second feet.

At the beginning of the April storm, there was a considerable snow pack in the Sierra Nevada resulting from the several smaller storms occurring in March, the snow cover extending to an unusually low elevation. By the night of April 8th, practically all of the low snow below the 5000-foot elevation had disappeared. The depths of snow on the ground at Norden at 8 a.m. were: April 8th, 152 inches; 9th, 158 inches; 10th, 152 inches; and 11th, 142 inches. It is doubtful whether the melting snow at the lower elevations contributed materially to the intensity of the stream run-off.

PROJECT FUNCTIONED PERFECTLY

The works of the Sacramento Flood Control Project functioned perfectly, and water did not rise to dangerous stages in any of the streams and by-pass channels, except in a few places where the project levees are not yet complete. A number of persons living in the overflow channels were rendered homeless, but no damage occurred in areas protected by the flood control system. All of the by-pass and overflow channels were covered with water and Little Holland and Prospect Island tidal reclamations in the lower Yolo by-pass were flooded.

The Sacramento River levee on the east side north of Colusa was nearly overtopped in a number of places, mostly at low spots such as road crossings. These were successfully protected by sandbags and earth. This levee is not yet completed to project height and cross section.

The Bear River was the only tributary in which a real flood occurred, the discharge being approximately 35,000 second feet near

BY-PASS AND WEIR IN OPERATION—Aerial view of normally dry land in the vicinity of Sacramento on which excess waters of the Sacramento River are being distributed and carried off through the Sacramento Weir, Sacramento by-pass and Yolo by-pass units of the Sacramento Flood control Project.

SACRAMENTO WEIR HANDLING 12,000 SECOND FEET at peak of flood is 1800 feet long and located 4 miles upstream from city. Water flowed over the weir at a depth of 1.65 feet but it was unnecessary to open the gates. Secondary State Highway Route 50 crosses on top of weir structure.

Wheatland and about 40,000 second feet at its junction with the Feather River, at which point the official project quantity is 30,000 second feet. This stream, therefore, had a peak discharge 30 per cent in excess of the project quantity. As a result of this extreme discharge, two breaks occurred in the incompleted levee on the north side of the Bear River near Wheatland, causing only nominal damage.

As has been stated, no damage occurred during this flood in areas protected by completed portions of the flood control project. Damages occurring on account of incompleted units of the project were on the Bear River, previously described, and near the mouth of Cache Creek in the Yolo by-pass, where about 200 acres of sugar beets were flooded. All other reported damage occurred in the by-passes and overflow chan-

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Giants Move 1,419 Yards Per Hour

(Continued from page 8)

bottom width of 100 feet and a length of about 2500 feet, with 5,000,000 cubic yards to be removed.

RIDGE CROSSES GULCHES

That the cut should be as deep as 280 feet is a result of the peculiar characteristics of the country. Oregon Ridge lies approximately midway between Junction City and Weaverville, rising to an elevation of 3100 feet, and extending in a north and south direction. Leading directly toward the ridge on the west is Oregon Gulch and on the east, Grub and Goodyear gulches. All of these slope gently upward until they reach a point near the base of the ridge, from which they rise steeply several hundred feet to the summit.

The effective result of this is almost complete lack of support on either side for any roadway grade leading from the ridge. By cutting deeply through the summit ridge, need for much of this nonexistent support is eliminated; and the grade can be held to a reasonable rate.

On February 28, 1934, hydraulic operations started in the removal of the sliding debris of the north rim and have continued steadily, with the exception of the summer season between July 15 and October 31, in accordance with existing State law for hydraulic operations in this section of the State, with the result that one year later 1,557,000 cubic yards of material had been removed at a cost of 2.7 cents per cubic yard.

The total movement to May 14, covering 14 months elapsed time or 11 months of actual operation, was 2,481,000 cubic yards. The unit cost for this quantity was 2.26 cents per cubic yard. The average movement was 1419 cubic yards per operating hour.

BETTER THAN ESTIMATE

This compares very favorably with the engineer's estimate for this period of 1,500,000 cubic yards, at a cost of $3\frac{1}{3}$ cents per cubic yard, nothwithstanding the fact that precipitation and stream run-off were far below normal during 1934, which resulted in a water supply that averaged only 9.2 cubic feet per second for the eight months of the past season; whereas, with normal weather and snow-pack, the water supply should have been twice or three times as great. Under ordinary methods, eight average sized power shovels and thirty or more trucks would have been required to equal this output.

Digging with water is fundamentally simple. Water confined to a pipe line or other vessel exerts a pressure on that vessel proportional to the vertical height to the nearest free surface, or the "head." If water under a head is allowed to escape from an orifice, it will do so with a velocity which depends on the amount of the "head." Anything loose, even soft bedrock, in the path of a stream under sufficient head, will be knocked violently out of the way, broken up and carried away in the stream which leaves the point of the jet.

FOUR REQUISITES

Four things are necessary for economical hydraulic excavation: first, a water supply; second, pipe lines and other structures to confine that water under high heads and conduct it to the point of use; third, an orifice in the shape of an hydraulic giant to control the emission of the water from the pipe; and fourth, sufficient grade leading away from the operations to give the tailing stream velocity enough to transport the excavated material. Since on Oregon Mountain these conditions are easily met, it was possible for the Division of Highways to embark on its unique venture in roadbuilding with assurance of success.

A typical setup for one of the hydraulic giants as used on Oregon Mountain, is as follows: From the regulating reservoir of 4,500,000 gallons capacity, there extends a pipe line about sixteen hundred feet long, built of riveted steel pipe, decreasing in diameter from 30 inches to 26 inches and 18 inches as the head on the pipe line becomes greater. Head available at the bottom end of the pipe to which the giant is connected is then about 400 feet. Because this head produces a pressure of about 170 pounds per square inch, or about six times that in an ordinary automobile tire, both pipe line and giant need to be securely anchored and braced.

GIANTS WEIGH TON

The key unit in the setup is the hydraulic giant, by which the water is directed against the bank to be excavated. The machines used weigh about one ton each and consist essen-

SUMMARY OF HYDRAULIC GRADING OPERATIONS ON OREGON RIDGE

Year and month	Days per month	Excavation, cu. yds.	Cu. yds. per day	Unit costs		Water Sup. C.F.S.	Monthly volume Water C.Y.	Per cent solids	Hours operated	Per hour	Duty
				Monthly	Average						
1934											
March	32	162,000	5,060	3.69c	3.69c	16.6	1,695,850	9.5	202.5	800	7.6
April	30	231,000	7,700	3.00	3.28	16.7	1,602,450	14.4	264.5	870	11.5
May	31	215,000	6,930	2.57	3.03	9.3	920,850	23.4	164.2	1,310	18.7
June	30	141,000	4,700	2.28	2.89	4.7	450,700	31.3	82.2	1,720	25.0
July	12½	16,000	1,280	2.86	2.89	1.5	60,590	26.4	11.7	1,370	21.1
October	1	2,000	2,000	3.43	2.89	2.9	9,400	21.3	1.8	1,090	17.0
November	30	233,000	7,770	2.27	2.75	5.4	519,040	44.8	88.6	2,630	35.8
December	31	182,000	5,870	2.77	2.75	7.3	714,150	25.5	103.4	1,760	20.8
1935—											
January	31	57,000	1,840	6.79	2.94	4.4	434,260	18.5	51.2	1,110	14.8
February	28	318,000	11,360	1.94	2.73	12.2	1,102,670	28.8	207.9	1,530	23.0
Total or average for year	256½	1,557,000	6,060		2.73	9.2	7,509,960	20.7	1,178.0	1,320	16.6
March	31	288,000	9,280	2.07	2.63	10.5	1,045,150	27.6	161.7	1,780	22.0
April	23½	636,000	27,060	1.20	2.26	24.3	1,822,150	34.9	322.9	1,970	27.9
Total or average to date	311	2,481,000	7,980	2.26		10.4	10,377,260	23.9	1,662.6	1,419	19.1

tially of a short steel spout pipe, to the outer end of which is screwed a cast steel nozzle of the size desired. Connecting the spout pipe and the supply pipe is a mechanism working on the principle of the ordinary universal joint, but larger, heavier, and hollow to allow the passage of water. The size of the nozzle, at the end of the spout pipe, varies from six to nine inches. Work on this project has been with seven and eight-inch nozzles.

From the eight-inch orifice, under 400-foot head, issues a stream traveling at the rate of 90 miles an hour, discharging 46½ cubic feet per second, or approximately a ton and a half of water. An equivalent amount of power would be represented by a string of average sized motor cars, traveling at a rate of 90 miles an hour, crashing into a bank at the rate of 60 per minute. Much damage is the inevitable result in either case, the chief difference being that the stream of water does damage to the bank, while the motor cars would succeed only in smashing themselves.

METHODS OF OPERATION

The giant is set in such a position that its stream can cut away the toe of the bank to be excavated. As the bottom of the bank is cut away, the top of the bank will weaken and topple down with a crash which breaks it into small particles easily carried away by the tailing stream. This process is repeated indefinitely, and many of the slides which result contain many thousand cubic yards. When the face of the cut has been moved too far away from the giant (the maximum practical distance at a 400-foot head is about 300 feet) the giant is dismantled and moved ahead as close to the bank as is safe.

While a one and one-fourth cubic yard power shovel will excavate 125 yards in an hour, the average maintained on this project by the hydraulic giant is 1300 yards per hour, with a maximum of 3000 yards.

UNDERCUTTING PRACTICE

It is practically as easy to undercut a bank 250 feet high as it is to undercut one of 50 feet; but, in the former case, five times the material comes down for each foot of undercutting, and the unit cost is consequently very much cheaper. Obviously, as high a bank should be maintained in front of the giant as possible. This explains, too, why the excavation of a deep cut in lifts, as is done with power shovels, is to be avoided. For the bank must then be undercut for each lift; less material caves down to be carried away for each foot of undercutting; the rate of excavation is, therefore, slower; and the giants and pipe lines must be moved more frequently.

A better method of finding how effectively the water is being used, is to calculate the percentage of solids being taken down by the tailing stream. This is the ratio between the volume of material removed and the amount of water used and to date has averaged 21 per cent, or one cubic yard of earth for each five yards of water. The maximum rate of exca-

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Ring Connectors Used in M Street Detour Bridge Lift Span

(Continued from page 4)

pleted in the dry. The approach piers, as well as the rest piers, were completed to an elevation above normal high water before the river raised to the extent of interfering with the work.

DETOUR BRIDGE NECESSARY

Another major item of work started early in the contract period was the construction of the railroad detour bridge about 100 feet north or upstream from the permanent bridge. The detour consists of nine plate girder spans and timber approaches and an 80-foot clear lift span, all supported on timber piles.

Except for the steel girders the detour bridge, being of a temporary nature, is built entirely of untreated timber. For efficiency and economy, split ring and toothed ring timber connectors were used to fasten the connections in the towers and trusses of the lift span. Another interesting feature of the temporary bridge is the use of gusset plates of plywood up to four inches thick and having as many as 31 plys or laminations.

The temporary railroad bridge was completed and traffic was taken from the old structure about February 1, 1935. The subcontractor began at once dismantling the 25-year-old bridge and removing the steel. That phase of the work was completed quickly and for the past month erection of the new steel has been proceeding rapidly. By May 1, the east span and tower was in place and erection of the west steel span was well begun.

COMPLETION SET FOR SEPTEMBER

It is expected that both towers will be completed by July 15, 1935, and the lift span in place by August 15, 1935. The construction of the deck, installation of machinery, wiring, lighting fixtures, paving approaches and miscellaneous small items of work will probably require the balance of the contract period, which ends September 30, 1935. The contractor anticipates no difficulty finishing within the time limit.

Although the total bid price of contract items was $907,000, it is expected that with certain extra work found necessary and with about $20,000 worth additional roadway and

(Continued on page 32)

Wild Flower Show Staged by District Highway Employees

By **E. Q. SULLIVAN**, District Engineer

THE COPIOUS and well distributed rains this year have caused the Mojave Desert to bloom as a vast flower garden. The desert wild flowers are the finest since 1928, and to give the people of San Bernardino an idea of Nature's bounteous display, the highway employees of District VIII staged for the second time a wild flower show in the District Office on April 6 and 7.

Flowers from all corners of District VIII were gathered early Saturday morning, marked as to location where found and carefully delivered to the San Bernardino office. When the show was opened to the public at 2.00 o'clock Saturday afternoon, every room was a bower of beauty.

200 VARIETIES LABELED

The main exhibit was in the drafting room where the long work tables were one mass of color. The other rooms of the building were filled with large bouquets and baskets of blooms.

Nearly 200 varieties were recognized and labeled with their popular names. The tall, white desert lilies, royal purple and gold asters, the striking desert candlesticks dominated the show with their beauty.

One feature greatly appreciated by the public was the exhibit of tiny transplanted "ground-cover" flowers in endless colors; these flowers looked like jewel mosaics.

Yuccas and cacti were segregated in one room. Varieties of petrified wood, desert curios and interesting highway maps and pictures were also on display throughout the building.

2000 FOLKS ATTENDED

During the two afternoons, nearly two thousand people registered, taxing the building to capacity. The flower show came to a delightful close Sunday night when botanists, school children and other flower lovers were allowed to select collections and carry them home for further study and enjoyment.

The entire District VIII office force served as a reception committee, and the enthusiastic and appreciative crowds made the affair a most happy one.

Little Girl (to eight-year-old boy): Oh, I think you are jus' lots better lookin' than your daddy.

Little Boy: I ought to be. I'm a later model.

WILD FLOWERS of the Desert as exhibited in District VIII Highway offices in the city of San Bernardino

CACTI BLOOMS. Yuccas and Striking Desert Candlesticks made a display of exotic beauty

DESERT LILIES tall and white with royal purple and gold Asters

200 VARIETIES included tiny ground cover floral jewels and larger blooms of radiant colors

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

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GASOLINE TAX DIVERSION

An official communication to the members of the Chamber of Commerce of the United States issued by President Henry I. Harriman in part reads as follows:

Taxes levied for highway use should be applied for highway purposes. * * * The membership of the chamber have by repeated declarations supported the principle that highway users, in addition to being fully subject to all other taxes, should through special taxes pay the cost of improving and maintaining the highways of general motor use, and that the proceeds of such special taxes should be applied exclusively for highways. * * *

The principle of nondiversion of special highway-user taxes was recognized by Congress last year in the Hayden-Cartwright Act, whereby any State will be denied a third of its Federal aid funds for highways if by diversion of user taxes it reduces its contribution to the Federal aid system * * *

The reasons underlying the chamber's position in support of the principle of nondiversion may be summarized as follows:

1. Diversion breaks faith with the highway user. He has generally accepted his responsibility for the major part of the highway bill, and this means of paying it. The money he thus pays obviously should not be put to other use.

2. Diversion creates resistance to proper and needed highway-user taxes. If the motor-using public know that the revenue from such taxes is likely to be diverted, they will not accept the burden thereof with the good will that has generally prevailed.

Professor: "The Chinese travel in junks. Now can anyone tell what junk is?"

Student: "Sure, dad's auto."

Gas Tax Returns in State Take Sudden Drop During March

OOPTIMISTIC statements recently released to the newspapers predicting that gasoline tax collections this year might exceed by approximately $5,000,000 those for 1934 appear to have been a bit premature in the light of a decided and not fully explained decrease in collections for the month of March.

The tax collecting board based its hopes for a record year on February taxes assessed to oil companies, which amounted to $3,063,237.07, or $268,109.43 more than collections during the same month in 1934. That figure brought the 1935 gas tax returns up to more than $670,000 in excess of collections for the same period last year, or a gain of 12.5.

On this percentage of increase was predicated estimates that if the ratio of upward trend in gasoline tax returns continued, California might expect to collect in 1935 a total of $44,500,000, or $4,950,000 more than in 1934.

But an entirely different situation existed on April 22 when collections for March were announced. Assessments for that month totaled $3,243,021.56, or $805,490.15 less than for March of last year, a loss of 19 per cent. Whereas at the end of February, receipts for the first two months of the year exceeded those of last year by approximately $670,000, at the end of March receipts for the quarter had fallen off $130,000 over the total for the same period in 1934.

Gasoline taxes for March, 1934, showed an increase of 24.4 per cent over the collections for the same month in 1933. This was larger than the amount for any month in 1933, although, normally, the yield in the summer months is higher than in the winter and spring.

The extreme downward fluctuation of assessments for the month of March indicates the futility of optimistic estimates such as those made two months ago.

Circus Manager: "Well, what's wrong now?"

India Rubber Man: "Every time the strong man writes a letter he uses me to rub out the mistakes."—*Boston Globe.*

First Married Woman—Aren't our husbands the limit, my dear? Does yours know what to do in a traffic emergency?

Second Married Woman—Sure, he's got ears.

TRAFFIC DEMANDS MORE ROOM in the South San Francisco underpass on Bayshore Highway. Dotted lines on photo of Southern approach show proposed widening operation on structure, hillside and roadway.

FORTY FEET MORE WIDTH of roadway will be provided through the underpass by extending the structure as shown by dotted lines on view of approach from north.

Widening Bayshore Highway Underpass

IN 1927 an undergrade separation structure was built separating the highway and Southern Pacific Railroad grades at the crossing on the Bayshore Highway in the southern city limits of South San Francisco. A forty-foot clear roadway was provided.

The subway was so designed as to permit the use of one abutment as a center pier when it became necessary to widen the roadway.

Due to the heavy traffic on this route, it has now been considered advisable to increase the width. Consequently, bids were received April 10, 1935, for a contract to construct a widening structure, providing an additional forty feet of roadway.

The contract was awarded April 30 on a low bid of approximately $130,000. In addition to the contract work it is estimated that railroad work incidental to the improvement will cost about $67,000, making a total cost for the project of $197,000, over 90 per cent of which will be furnished as a part of the work relief program of the Federal government and administered through the U. S. Bureau of Public Roads.

The original subway, including both railroad and highway, cost nearly $300,000. It is expected the present contract work will be completed early in 1936.

Before a man laughs at the awkward way his wife parks the car, he should look at himself when he sews a button on his shirt.

Doctor: "If your nerves are frayed, the thing to do is to bury yourself in your work."

Patient: "And me a concrete mixer!"

New Office Building for District III in Marysville Opened With Banquet

THE NEW office headquarters of District III in Marysville was formally opened Saturday evening, May 4, the occasion being celebrated by a banquet sponsored by the Sutter-Yuba Chamber of Commerce. The banquet was followed by an inspection of the building by the public, and Sunday afternoon, between the hours of two and five, the building was also opened for public inspection.

The dinner was attended by Director of Public Works Earl Lee Kelly, Deputy Director Edward J. Neron, Assistant State Highway Engineer G. T. McCoy, Chairman Harry A. Hopkins of the California Highway Commission, State Senators W. P. Rich and Thomas Scollan, District Engineers F. W. Haselwood from Redding, Jno. H. Skeggs from San Francisco, and Robert E. Pierce from Stockton.

In addition to these guests there was a large delegation of members from headquarters staff at Sacramento, representatives from the boards of supervisors and other county officials of the eleven counties comprising District III, members of the local and State chambers of commerce and employees of the Department of Public Works, and the Division of Architecture. In all there were about 350 guests present at the banquet.

The meeting was conducted by President Horace E. Thomas of the Sutter-Yuba Chamber of Commerce, and the main speaker of the evening was Director of Public Works Earl Lee Kelly.

The audience listened with rapt attention when Director Kelly told of the serious financial situation the State highway system is facing owing to attempts to divert many millions of gasoline tax dollars to other than highway uses as proposed in bills before the Legislature.

HIGHWAY DIVISION EXECUTIVES at Marysville Headquarters celebration in the above group, left to right are—J. G. Standley, Principal Assistant Engineer; G. T. McCoy, Assistant State Highway Engineer; Edward J. Neron, Deputy Director of Public Works; R. H. Wilson, Office Engineer; F. J. Grumm, Engineer of Surveys and Plans; District Engineers C. H. Whitmore, R. E. Pierce and F. W. Haselwood and Materials and Research Engineer T. E. Stanton.

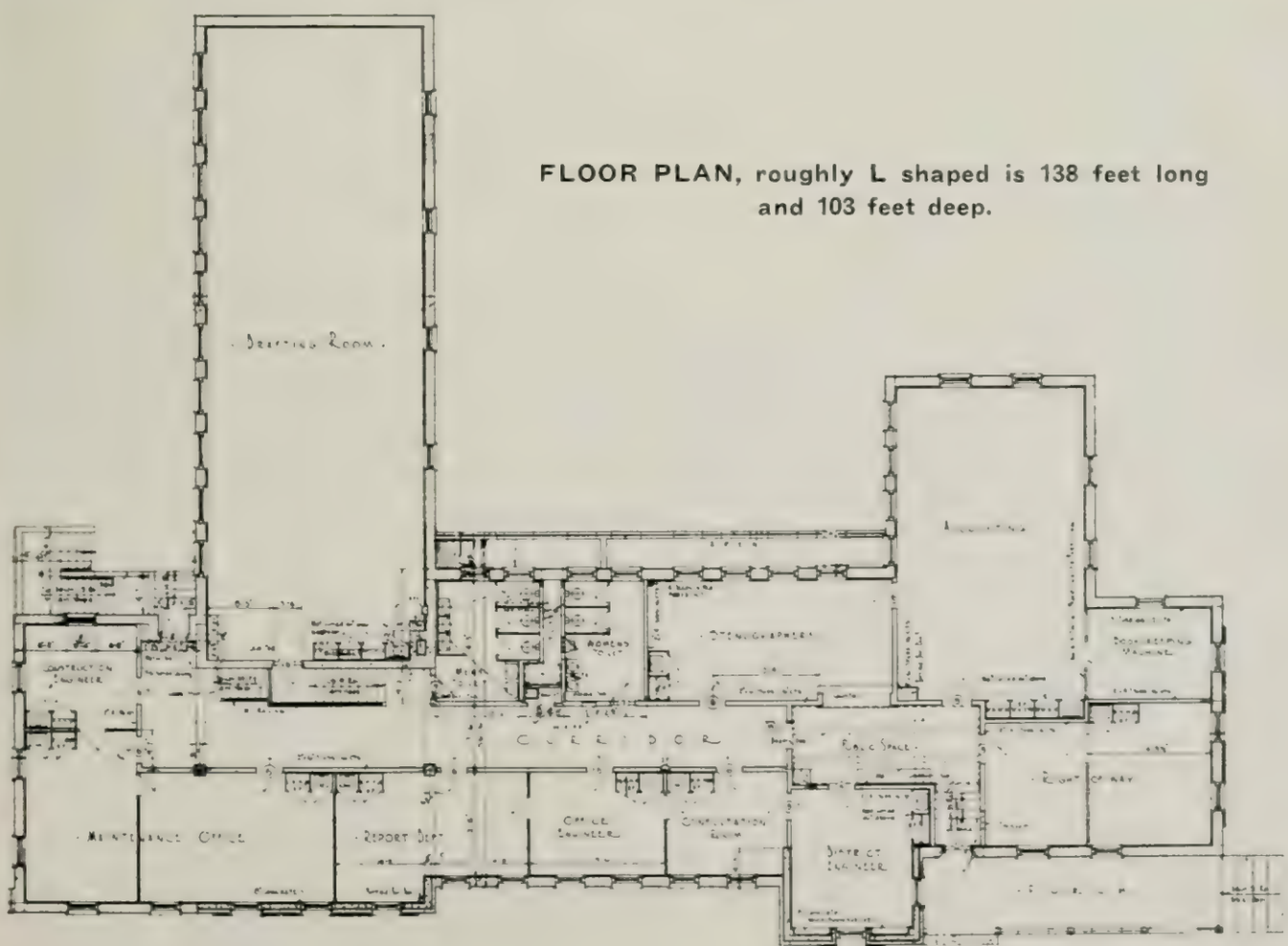
If these attempts are successful, Mr. Kelly said, it will be necessary to stop practically all highway construction work on July 1st when the new biennium starts.

Mr. Kelly explained that in addition to the

(Continued on page 28)

NEW MARYSVILLE HEADQUARTERS for District III of the Division of Highways is a class C brick building of Early California type architecture. It provides 12 offices in addition to drafting, blueprint and waiting rooms, laboratory and large basement storage space. It represents an investment of $60,000 on a lot donated by Marysville City School Board.

FLOOR PLAN, roughly L shaped is 138 feet long and 103 feet deep.



Working Models Feature State Exhibit

(Continued from page 2)

exhibits showing the State of California at work.

The map will picture in detail highways, parks, natural resources, waterways, city and county developments, and in the center will be imposed a cut-away educational picture of the Capitol, showing legislative, executive and judicial departments of State government at work.

Individual exhibits are well under way for the counties and displays of the Department of Public Works, Department of Motor Vehicles, Department of Natural Resources, Department of Agriculture, Department of Military and Veterans' Affairs, Bureau of Printing, Division of Criminal Investigation, and the State's famous Indian Museum.

DIVISIONS SHOW WORKING MODELS

Typical of the exhibits the State will feature in its "California at work" program is that of the Department of Public Works. In this display will be the Division of Water Resources' working model of Central Valley Water Project; Division of Architecture's models of new Camarillo State Hospital and Santa Barbara State Teachers College; Division of Highways' working models of material testing devices and modern highway and bridge construction, and San Francisco-Oakland Bay Bridge Authority's working model, showing the cable spinning on the gigantic span now nearing completion over San Francisco Bay.

Department of Motor Vehicles will feature its Division of Registration, California Highway Patrol, Division of Accounting, and Division of Operators' Licenses and Adjustments, all at work under a 25-foot display map of the United States illustrating various kinds of license plates used in the different states, licenses of foreign nations and an exhibit showing how the State maintains nearly 100,000,000 records of motor vehicles and enforces its traffic regulations to protect human life and property.

PANORAMAS OF NATURAL RESOURCES

The Department of Natural Resources exhibit will take up a space the length of the great relief map and will be situated to take advantage of ceiling-to-floor panoramas built on the reverse of the big map. In this exhibit will be seen elaborate models of parks and forests, fish and game activities, mines and oil fields, etc.

The State Athletic Commission's display will show how State governed athletic activities pay all expenses for operation of California's veterans' home at Yountville and the Bureau of Criminal Identification exhibit will be a graphic story of how modern methods are used to eliminate crime—a story of the teletype, fingerprints, chemistry and ballistics.

In addition to standing displays, an auditorium is provided for a continuous motion picture of California, its history, progress and prosperity.

A hospitality typical of California will be provided by a corps of gracious women under direction of Mrs. Celia A. Dunham, prominent social and club leader of the State, who has been appointed hostess for the State Building by Governor Frank F. Merriam. Wallace Walters is Supervisor of Exhibits and Sam Williams custodian of the building.

It is confidently predicted that when the doors of Balboa Park open for the fair May 29, the world will realize California's Legislature wisely provided means for the State to "stimulate recovery" and "end economic depression and unemployment" as the terms of legislation suggest in making appropriation for a State exhibit at California Pacific International Exposition.

STATE MAPS OUT DEVELOPMENT SAN DIEGO WATER RESOURCES

Plans for the complete development of the water resources of the San Diego River Basin and flood control of the San Diego River in the Mission Bay area are contained in Bulletin No. 48, "San Diego County Investigation," issued by the Division of Water Resources.

The publication presents detailed data and information on the water supplies and agricultural lands of San Diego County; the present status of irrigation and domestic water supply developments; the utilization of water supplies from surface and underground sources; the irrigable lands and water requirements and the domestic and municipal requirements of the metropolitan area, and the flood flows of the principal streams and probable frequency of occurrence.

The investigation was made by P. H. Van Etten, senior hydraulic engineer, under the direction of A. D. Edmonston, deputy State Engineer, and was undertaken in cooperation with the county of San Diego and the city of San Diego. The bulletin comprises six chapters and two appendices and includes 55 tables and 30 plates, maps and diagrams.

Car Owners Average 7250 Miles per Year

Do you drive your auto 7250 miles a year? The average California car owner does, it was developed by the Division of Highways in a recent road transportation survey.

This mileage was arrived at by questioning drivers of 108,000 passenger autos, about 6 per cent of the entire passenger registration for last year of 1,712,000.

It also was found that the average age of passenger motor vehicles is 5.3 years. Half of the total number are nearly six years old; in fact, one-fourth are more than seven years old.

From the total mileage produced by these 108,000 cars, an annual average of 7250 miles per year is computed. The annual mileage of a car decreases with its age. Cars in the two-year-old group—those in the first full year of operation—averaged 11,900 miles, and those eight years of age averaged only 2500 miles. It is considered in the transportation report, therefore, that the average of 7250 miles annually is conservative.

A total of 326,342 motor vehicles registered in other states used California highways last year and the survey showed these averaged 1500 miles on State roads.

HYDRAULICKING FOR HIGHWAY CUT

(Continued from page 17)

vation attained is 45 per cent solids—one yard of earth to each two and two-tenths yards of water.

The nearest comparable operation to the present work on Oregon Mountain was the mining excavation work carried on by the La Grange Mine. Because their speed of excavation was restricted by the need for running all material through sluice boxes, it can not be expected that their rate of removal would be so high. It is interesting, however, to note that 12 per cent of solids was their maximum rate of excavation, about one-half of the State's average rate of performance, and about one-fourth of the State's maximum rate of performance.

Twenty-one men are employed at the present time. Most of these are used for moving pipe lines and giants. For operation of the giants, a crew of three men is necessary: one at the reservoir, one at the giant, and one watchman. To spread the work to as many men as possible, labor works only thirty hours per week. The present monthly expenditure on this project is approximately $3,000.

3000 ADDITIONAL MILES OF AUTOMOBILES USED ON BUSY HIGHWAYS IN 1934

The increase in automobile ownership of 1,000,000 vehicles in 1934 over 1933 placed almost exactly 3,000 miles of additional cars on the nation's already busy roads and streets.

There about 11 times as many cars on the roads and streets today as there were 20 years ago and there is less improved road space per car.

Progress of course has been made, yet today there are still four times as many cars per mile of improved roads as there were in 1915.

Gasoline consumption figures indicate that today's cars are used at least 50 per cent more than those of 20 years ago. On that basis, today's improved roads are at least six times busier than those of 1015.

BY-PASS CHANNEL RELIEVED RIVER

(Continued from page 15)

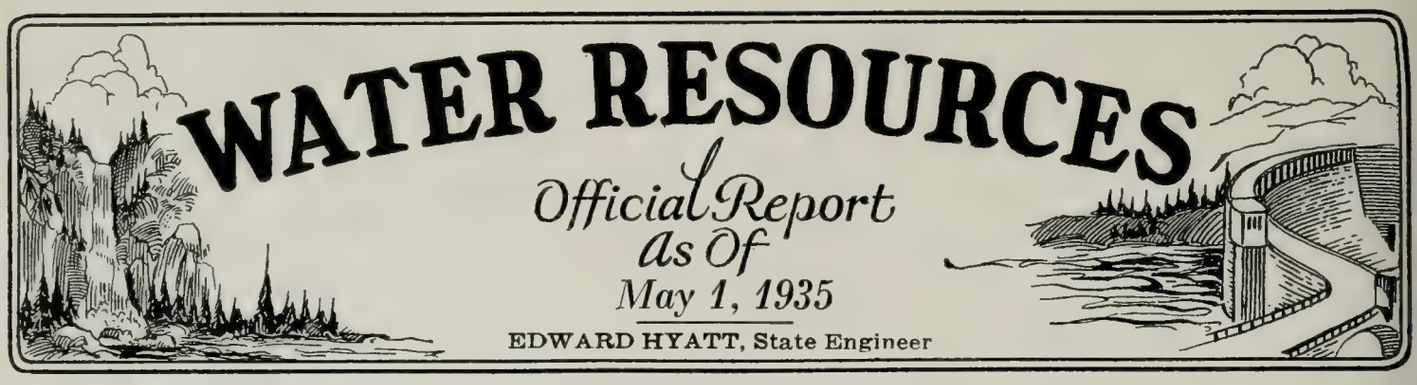
nels, which are intended to be used primarily for the passage of flood waters. The tidal reclamations in the lower Yolo by-passes are expected to be flooded at every high water.

All other reported damages in the Sacramento Valley were outside of the flood control area, and were due to the usual storm mishaps caused by heavy rainfall on particular areas. Some damage was caused to the highway and railroad near Arbuckle and also near Lincoln in Placer County. At the latter place the highway was flooded and a section of the Southern Pacific track was washed out by an unusually heavy flow in Coon Creek. Four men were drowned in the flood and ten railroad section men lost their lives while making repairs to the track.

Generally, the public had the impression that the flood situation was more serious than it actually was. It should be realized that certain areas such as by-passes, etc., must be reserved for flood relief and that they are intended to be flooded at intervals.

ENGLAND PUTS POLICE GIRLS ON TRAIL OF SPEED BOYS

In England, the road-hog had better watch his step. Police Commissioner Lord Trenchard has appointed a squad of police women to help enforce the new 30-mile-an-hour speed limit in built-up areas. These police women will ride in parties in automobiles. All will wear plain clothes. If a motorist passes at too high speed, the girls will sound a gong. Then police signs will flash on the car and the offender will be summoned to traffic court.—*Public Safety.*



The State Engineer who has been in Washington, D. C., during the past month in furtherance of Federal approval of the Central Valley Project and securing Federal funds for its construction reports very encouraging progress and expects favorable action shortly after the executive order is issued by the President outlining the organization set up for the work relief program under the $4,880,000,000 Federal relief fund.

Final action on Federal financing of the Central Valley Project may come within a very short time after issuance of the executive order. The Federal government's recognition of the Central Valley Project has been recorded in the action of the House passing the omnibus Rivers and Harbors Bill which authorizes $12,000,000 towards the cost of the project. The bill carries out the recommendation of Army engineers who estimated that flood control values in the construction of Kennett Dam would benefit the government to the amount of the appropriation suggested.

All Federal agencies that have investigated the project and all Federal bodies interested have given a favorable report and it is therefore believed that with the completion of the President's new organization set up a prompt decision will be made relative to the Central Valley Water Project.

Other activities of the division are detailed in the monthly report as follows:

IRRIGATION DISTRICTS

Action on the petitions of the directors of various irrigation districts to the California Districts Securities Commission is shown in the following orders of the commission issued to the districts:

Modesto Irrigation District, Stanislaus County—

Bonds in the principal amount of $177,000 as security for a construction loan of like amount from PWA, validated.

South Fork Irrigation District, Modoc County—

Bonds in the principal amount of $133,000 as security for a construction loan of like amount from PWA, validated.

San Dieguito Irrigation District, San Diego County—

Bonds in the principal amount of $202,500 as security for an RFC loan of like amount with which to refinance the district, validated; also, expenditure of $5,360 to certain landowners for money advanced to the district for construction work, approved.

Palo Verde Irrigation District, Riverside County—

Readjustment of district debt through provisions of Chapter IX of the Federal Bankruptcy Act, approved. Amount involved $4,174,300.

Corcoran Irrigation District, Kings County—

Readjustment of district debt through provisions of Chapter IX of the Federal Bankruptcy Act, approved. Amount involved $733,000.

Merced Irrigation District, Merced County—

Readjustment district debt through provisions of Chapter IX of the Federal Bankruptcy Act, approved. Amount involved $16,190,000.

El Dorado Irrigation District, El Dorado County—

Feasibility of voting refunding bonds in the principal amount of $360,500, approved; also refunding expenditures in the sum of $5,350.50 approved.

Thermalito Irrigation District, Butte County—

Feasibility of voting refunding bonds in the principal amount of $172,500 approved.

Palmdale Irrigation District, Los Angeles County—

Maturities, terms and conditions of exchange of refunding bonds approved. The exchange involves the surrender to the district of $445,000 principal amount of original district bonds for $222,500 of refunding bonds.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period there were several rainstorms, none of which could be classed as a major storm. Commencing on April 6th, a storm of fair intensity developed over the Sacramento River watershed. The rainfall was heavy but of short duration and the resulting stream flows reached only medium flood stages. The Sacramento River throughout its length reached comparatively high stages, but the relief over the weirs into the by-passes was comparatively small and it was not necessary to open the Sacramento weir. All of the by-passes and overflow areas were covered with water.

Prospect Island and Little Holland Tidal Reclamations were flooded, two small breaks occurred on the Bear River near Wheatland, and some difficulty was

Salinity Eliminated by April Floods

(Continued from preceding page)

experienced in holding the Sacramento River levee on the east side above Colusa. Otherwise little damage was done by the flood, except to the homes of squatters in the overflow areas. Full details of operation of the flood control project will be found elsewhere in this magazine.

SERA RELIEF WORK

Work under the SERA projects during this period has been disorganized since the storm of April 6th because of flood waters covering the areas in which work had been progressing. On April 9th work was resumed on the Bear River.

A total of 20,705 man-hours of relief labor was worked during this period, making a total to date of 228,467 man-hours. The work done during this period is as follows:

	Man-hours
Federal Transient Service, upper Sutter By-pass	1,190
SERA Project No. 58-B14-15, Feather River north of Marysville	3,748
SERA Project No. 58-B13-35, Feather River south of Marysville	5,519
SERA Project No. 35-B14-222, leveling spoil bank, American River	172
SERA Project No. 51-B13-10, Bear River	5,846
Federal Transient Service, seepage canal	220
SERA Project No. 51-B14-39, Butte Slough By-pass	2,754
SERA Project No. 51-B14-39, Nelson bow levee	730
SERA Project No. 51-B14-39, cutting thistles and weeds on levees and warehouse property	526
Total	20,705

DAMS

Application for the enlargement of the Flora Steele Dam located in San Mateo County was filed on April 12, 1935, the estimated cost of which is $3,000.

Revised plans and specifications accompanying an amended application for construction, at a total cost of approximately $15,337,081, of San Gabriel Dam No. 1 were filed by the Los Angeles County Flood Control District on April 13, 1935. The amended application provides for modified specifications and an enlarged section. The proposed structure, when completed, will have a height of approximately 370 feet and will store 56,000 acre feet.

The repair work on Los Verjels Dam on Dry Creek in Yuba County has been completed for the season.

In the Santa Clara Valley work is well under way at Vasona Dam and on the Calero Dam, the auxiliary structure of the latter being practically complete. Excavation for the outlet conduit at the Stevens Creek Dam is progressing.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work has continued during the past month in compiling the 1933 and 1934 reports. These will comprise the records of diversions, stream flow, return flow and salinity. Salinity sampling is being maintained at sixteen permanent stations on the upper bays and in the Delta.

During the recent April storms, the flow of the Sacramento River at Sacramento reached about 95,000 second feet on April 9th. At the same time there was considerable flow in Yolo By-pass. The flow dropped to about 65,000 second feet on April 15th and increased to 69,000 second feet on April 19th. With the sustained flow of this magnitude, salinity has been practically eliminated to the lower end of Suisun Bay as shown by the following results for samples taken on April 14th:

Salinity at Upper Bay and Delta Stations on April 14, 1935

Station	Salinity in parts of chlorine per 100,000
Point Orient	720
Bulls Head	1
O and A Ferry	4
Collinsville	2
Emmaton	1
Antioch	3
Dutch Slough	2
Rindge Pump	1
Middle River	3

WATER RIGHTS

Thirty-five applications to appropriate water were received during the month of March, 11 were denied and 21 were approved. In the same period 12 permits were revoked and 12 passed to license.

On October 1st progress reports were requested from 1292 permittees and to date 1143 replies have been received. On the basis of these reports 148 cases have been listed for inspection during the coming field season, 39 permits have been revoked and 179 extensions have been allowed.

On October 15th reports were requested from 433 licensees and to date 403 replies have been received, on the basis of which 31 cases have been listed for investigation and 12 licenses have been revoked.

FEDERAL COOPERATION TOPOGRAPHIC MAPPING

During the month of March drafting was completed in connection with the Eureka Quadrangle in Humboldt County and the Bogus Quadrangle in Siskiyou County and progress was made in connection with the Treadwell Quadrangle in Kern County. In addi-

(Continued on page 28)

350 Attend New Office Building Fete

(Continued from page 22)

millions proposed to be diverted for State general fund purposes through pending legislation, the State stands to lose by such diversions many more millions of Federal aid funds with the result that the only money available for northern California will be that already pledged for the San Francisco-Oakland Bay Bridge approaches.

Chas. H. Whitmore, division engineer in charge, spoke briefly, in response to the welcoming addresses of Mayors Leo J. Smith of Marysville and E. E. Benham of Yuba City. Whitmore introduced numerous members of his staff and thanked the chamber of commerce and the Marysville school board for their assistance and cooperation in obtaining the new headquarters building site.

Music for the occasion was supplied by the Harmony Glee Club, under direction of Ralph B. van Courtright, and the singers won most enthusiastic applause.

It was estimated that more than half the assemblage was from communities outside of Sutter and Yuba counties. The State chamber of commerce was represented by William Boucher of Sacramento and H. H. Dunning of Marysville.

EARLY CALIFORNIA STYLE

The new district office building is located at the corner of Seventh and B streets on a lot approximately 163 feet square. To the rear of this lot is a second area of equal size which is to be developed as a maintenance yard. The plot was donated to the State by the school board of the city of Marysville.

The building itself is a class "C" structure with exterior walls of brick. Interior bearing partitions, floor and roof construction are of wood. The roof covering is of shingle tile, the brick walls painted. In style the building is a single story "Early California" type.

FLOOR PLAN L SHAPED

The floor plan is roughly L shaped, being 138 feet long and 103 feet deep.

There are 12 offices provided on the first floor, as well as a public waiting room and a large drafting room. In the basement is an overflow drafting room, a laboratory, a blueprint room and storage space.

Nearly all of the basement area is excavated.

Winter heating is cared for by an oil fired boiler plant connected to direct radiators, except in special locations, where fan type unit heaters are employed. For hot weather a water cooled air ventilating system provides cooled air to all offices and work rooms.

HAS OWN WELL

Water for this system is taken from a deep well which is also connected to a pneumatic system for water supply to plumbing fixtures.

Sound and heat insulation of office ceilings is secured by the use of insulating board.

All lighting fixtures in working areas are of the indirect type.

The building, when complete with walks, driveways, parking area, lawn, shrubbery, and sprinkling system, will represent an investment of approximately $60,000.

BUILDING INDUSTRY INCREASE SHOWN BY LICENSES GRANTED

With all trade indices pointing to an unmistakable upward trend in construction activities, William G. Bonelli, director of the California Department of Professional and Vocational Standards, calls attention to a flood of applications for contractors' licenses pouring into his office as further evidence of a more stable condition within the building industry.

In March, he reports, 460 licenses were issued, of which 406 were granted to persons entering the various branches of building and construction for the first time. In the forepart of April, 301 licenses were granted, of which 255 went to new contractors. The total number of licenses issued by this bureau for the fiscal year to date is 22,297, or only 173 behind the total of 22,470 for the entire fiscal year which ended June 30, 1934.

ADVANCE MAP SHEETS AVAILABLE

(Continued from page 27)

tion thereto triangulation was completed in connection with the Elk Creek Quadrangle in Tehama, Glenn and Mendocino counties.

Advance sheets are now available for the Colfax Quadrangle in Placer and Nevada counties. This is a revision of the former quadrangle sheet which was surveyed in 1885-87. The advance sheet is published on a scale of 1:96,000 and will finally be published on a scale of 1:125,000, which is the same scale as the original.

Advance sheets of Mint Canyon, Red Rover and Lake Quadrangles in Los Angeles County are now available. These are published on a scale of 1:24,000 with contour intervals of 5 and 25 feet. The surveys for these quadrangle sheets were made in 1931 and 1932 by the U. S. Geological Survey in cooperation with Los Angeles County.

Highway Bids and Awards for the Month of April

ALAMEDA COUNTY—Over A. T. & S. F. Ry., S. P. Co., & Key System in Oakland; steel and concrete viaduct. District IV, Routes 5, 69. Sections Oak. Emy. Mittry Bros. Const. Co., Los Angeles, $1,053,-965; Clinton Construction Co., San Francisco, $1,087,800; N. M. Ball & Bodenhamer Const. Co., Oakland, $1,965,780; MacDonald and Kahn Co., Ltd., San Francisco, $1,094,118; Healy Tibbits Construction Co., San Francisco, $1,169,550; Bates and Rogers Construction Co., Oakland, $1,067,813. Contract awarded to Barrett & Hilp, San Francisco, $1,026,780.

ALAMEDA COUNTY—In Hayward between South boundary and "B" St., 0.6 mile. Grade and A. C. & P. C. C. Pave. District IV, Route 5, Section Hay. Hanrahan-Wilcox Corporation, San Francisco, $27,-896; Union Paving Co., San Francisco, $26,240. Contract awarded to Jones and King, Hayward, $24,389.

ALAMEDA COUNTY—In Hayward between "B" St. and North City Limits in San Leandro, between South City Limits and Begier St., 1.9 mile. Plane surface fill rail trenches and place Plant-mix surface (Med. curing type). District IV, Route 105, Sections Hay. and SLn. Union Paving Co., San Francisco, $16,826; Ransome Co., Emeryville, $14,256; United Concrete Co., Portland, Ore., $15,262; Jones & King, Hayward, $14,177; Hanrahan-Wilcox Corp., San Francisco, $16,697. Contract awarded to Lee J. Immel, Berkeley, $14,176.50.

KERN COUNTY—Between one-half mile S. and 4 miles east of Western Water Works Pumping Station; 4.5 miles. Grade and Bit. Tr. Sel. Surf. Mat'l. District VI, Route 140, Sec. A & B. C. W. Caletti & Co., San Rafael, $48,388; Stewart & Nuss and John Jurkovich, Fresno, $50,827; Gogo and Rados, Los Angeles, $46,124; J. L. Conner, Monterey, $57,729; Dimmitt and Taylor, Los Angeles, $55,831. Contract awarded to Basich Brothers, Torrance, $44,862.80.

LOS ANGELES COUNTY—Between Ocean Ave. and Lincoln Blvd., 0.6 mile, A. C. & P. C. C. Pave. District VII, Route 60, Section S. Mca. J. L. McClain, Los Angeles, $66,563; Gogo and Rados, Los Angeles, $69,882; Geo. R. Curtis Paving Co., Los Angeles, $69,275; Sharp & Fellows Const. Co., Los Angeles, $69,587; Oswald Bros., Los Angeles, $64,529; United Conc. Pipe Corp., Los Angeles, $62,970. Contract awarded to Griffith Co., Los Angeles, $60,923.40.

LOS ANGELES COUNTY—In City of Inglewood. Between Prairie Ave. and Commercial Street, 0.5 mile, A. C. or P. C. C. Pav. and Plant Mix Surf. Shoulders (Med. curing type). District VII, Route 174, Section Ing. Geo. R. Curtis Paving Co., Los Angeles, $24,435; So. Calif. Roads Co., Los Angeles, $26,192; Griffith Company, Los Angeles, $24,963; Mundo Engineering Co., Los Angeles, $26,580; Oswald Bros., Los Angeles, $25,397. Contract awarded to United Conc. Pipe Corp., Los Angeles, $23,515.50.

MENDOCINO COUNTY—In Ukiah & Willits, 1.3 mile retread surfacing. District I, Route 1, Sections Uki. and Wlts. Ransome Company, Emeryville, $16,762; Lee J. Immel, Berkeley, $18,322; Sidney Smyth & Albert Helwig, San Rafael, $17,820. Contract awarded to E. A. Forde, San Anselmo, $15,561.02.

PLUMAS COUNTY—Two bridges across N. Fk. Feather River at Rock Cr. and near Storrie, steel spans. District II, Route 21, Section A. Bodenhamer Construction Co., Oakland, $115,838. Rocca & Co., San Rafael, $123,619; Lord & Bishop, Sacramento, $114,801; Bates & Rogers Construction Co., Oakland, $122,144. Contract awarded to M. B. McGowan, Inc., & C. W. Caletti and Co., San Francisco, $113,448.

SAN DIEGO COUNTY—Through the Narrows, 1.7 mile. Grade and road mix surface treat. District XI, Route 198, Section F & G. Geo. J. Bock & Son, Los Angeles, $40,390; Daley Corp., San Diego, $48,200; V. R. Dennis Const. Co., San Diego, $49,896; Sharp & Fellow, Los Angeles, $55,699. Contract awarded to Dimmitt & Taylor, Los Angeles, $34,891.80.

SAN JOAQUIN COUNTY—Between French Camp and Stockton, 3.8 miles. Grade and A. C. Pavement. District X, Route 5, Section B & Stockton. Chas. L. Harney, San Francisco, $109,244; Valley Paving and Construction Co., Fresno, $108,188; Fredrickson and Watson Construction Co., Fredrickson Bros., Oakland, $109,663; A. G. Raisch, San Francisco, $103,283; Hanrahan-Wilcox Corp., San Francisco, $99,728; A. Teichert & Son, Inc., Sacramento, $108,013. Contract awarded to Heafeyomoore Co., and J. A. Casson, Oakland, $89,977.40.

SAN MATEO COUNTY—Between Crystal Springs Road and Third Ave., 0.2 mile; grade and A. C. Pave. District IV, Route 2, Section S.M. L. C. Seidel, Oakland, $53,268; Hanrahan-Wilcox Corp., San Francisco, $57,511; The Fay Improvement Company, San Francisco, $55,672; Chas. L. Harney, San Francisco, $58,531. Contract awarded to A. G. Raisch, San Francisco, $46,280.10.

YOLO COUNTY—In Woodland, between S. C. L. and Main St., 0.6 mile. Grade, widen, and surface. District III, Route 7, Section Wd. A. G. Raisch, San Francisco, $31,775; Hemstreet & Bell, Marysville, $34,879; Ransome Company, Emeryville, $35,592; Chas. L. Harney, San Francisco, $34,333; Lee J. Immel, Berkeley, $33,654. Contract awarded to A. Teichert & Son, Inc., Sacramento, $29,414.50.

States Memorialize Congress to Abolish Gasoline Tax June 30

WASHINGTON, D. C.—More than 250 organizatons, representing millions of citizen taxpayers, have filed protests against Federal taxation of gasoline with members of Congress. In addition, legislatures of 21 states have adopted memorials asking that the tax be ended with the expiration date, June 30 next.

The Federal gasoline tax, it is pointed out, was enacted in 1932 as a temporary emergency measure and was re-enacted in 1933 and again in 1934. The first year the tax cost the American motoring public $62,839,826, the tax becoming effective in June of that year. In 1933 the amount derived was $181,125,987, and in 1934 it was $170,109,269, making a grand total of more than $414,000,000.

The original rate was 1 cent per gallon, which was increased to 1½ cents in 1933, and reduced to 1 cent in 1934.

It is contended that the "emergency" which necessitated the imposing of a gasoline tax by the Federal government is ended. Revenue from taxes levied upon alcoholic beverages and substantial increases in revenues from virtually all other Federal taxes have given the government sources of income lacking when the "temporary" tax was placed upon gasoline in 1932.

States which have memorialized Congress to repeal the Federal tax include: Arkansas, California, Colorado, Florida, Maine, Maryland, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Mexico, New York, North Carolina, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, and Utah.

Congressional committees have recommended that this tax be removed by letting it die on its expiration date, June 30, 1935.

Snow Plow and Crew Buried Under Slide That Brings Death to One Man

DANGER and hardships—sometimes death—encountered by the men of the Division of Highways who battle through the winter months to keep snow-covered roads in California mountains open to travel are little realized by motorists who use the cleared traffic lanes.

Combating storm conditions in two widely separated districts, the Division of Highways in March and April suffered the loss of one man and the injuring of another, both members of snowplow crews engaged in conflict with the elements.

Henry C. White, assistant operator of a plow in the Lake Tahoe region, was killed, buried under an avalanche of snow, and Kenneth Knight was injured and his machine badly damaged in an accident near Oregon Mountain in Del Norte County.

BURIED BY SLIDE

Entombed by the same snowslide that brought sudden death to White, Operator Jack Rowe miraculously escaped by digging himself out.

White and Rowe were attacking a snowslide in which they feared an automobile might be trapped when tragedy engulfed them without warning. The two men, on Sunday afternoon, April 7, were dispatched with their snow plow to a point on the roadway between Bay View Rest and Eagle Falls near Emerald Bay on State Route 38 along the west side of Lake Tahoe. Tons of snow had swept down the mountainside, burying the road to a depth of 20 feet and for a distance of 500 feet. Because the slide had not been witnessed it was thought entirely possible that a passing automobile might have been imprisoned.

The two men drove their plow into the drift, dreading what they might uncover. They had proceeded about 15 feet when the auger shear bolt of their machine, encountering hard snow and ice, snapped off. Both operators went to the front of the plow to make repairs. It was found that a chisel was required and Rowe climbed into the cab to get one from the tool chest.

SNOWSLIDE TRAGEDY—At top, scene of slide on Lake Tahoe highway. Center—First rescuers find only exhaust pipe of plow protruding above snow. At bottom—Plow partly exhumed in recovery of victim's body.

While thus engaged he heard an ominous sound which he later described as a "swishing noise." He remembers nothing more until he came to and discovered himself buried alive under a great mass of snow. Beside him was a jagged piece of broken window glass from the cab of the plow. With this, he feverishly dug himself out and immediately began a frantic search for

Snow Plow Plunges off Grade to Bottom of 100 Foot Canyon

White. Digging into a drift at the front of the machine he finally extricated his assistant. His efforts to revive White failed and so he went down the mountain to Emerald Bay and telephoned for help.

WHITE INSTANTLY KILLED

When the rescuing party arrived at the scene it was learned that White had been almost instantly killed. Investigation revealed that a second snowslide 200 feet wide had struck the snow plow and the force of it had thrown Rowe across the width of the cab of the machine and out the other side through the glass window of the cab door. It was a piece of this broken window that enabled Rowe to exhume himself.

What might have been a fatal accident befell Kenneth Knight on March 20 while he was enroute with truck and snowplow to Oregon Mountain. Just west of Idlewild on Route 1, the truck with plow suddenly shot off the road, dropped 50 feet and continued its plunge to the bottom of a 100-foot canyon, landing in the bed of the Smith River.

REMARKABLE ESCAPE

Knight either jumped or was thrown from the truck, and picked himself up 40 feet down the slope. Strangely enough, his machine remained on its wheels for the entire distance to the river.

Operator Knight had no recollection of how the accident occurred. He was going around a sharp right curve, the road being covered with three inches of fresh snow, which lay over a thin sheet of ice next to the pavement. It is believed the front wheels of the truck were cramped to the right, skidded on the icy roadbed and threw the machine into the canyon. The damage to the truck was $1,200, the damage to the plow unestimated. Knight escaped with a few severe bruises.

Bulgaria has instituted a road tax of three per cent of the market value of all motor vehicles and trailers, the tax being payable at the time of the issuance of the first license.

Policeman (after the collision): "You saw this lady driving toward you. Why didn't you give her half of the road?"

Motorist: "I was going to, as soon as I could discover which half she wanted."—*Stray Stories.*

Right of Way Agents Form Association in Southern California

WITH a desire to make the public better acquainted with their work, a group of right of way men in the Los Angeles area recently organized the Southern California Right of Way Agents' Association which has embarked upon the publication of a monthly magazine of its own.

The officers of the association are: Frank C. Balfour, State Division of Highways, Los Angeles, president; George A. Mitchell, vice president; Ralph F. Beegan, secretary, and H. S. Swearingen, treasurer.

The first issue of the magazine, *The Right of Way,* is off the press. Ralph F. Beegan and George A. Mitchell of the Los Angeles County road department are publisher and managing editor respectively. Robert I. Plomert, Jr., General Petroleum Corporation, Los Angeles, is editor and has as assistants Louis A. Griley, South Gate; Frank M. Colville, Los Angeles flood control department, and Fred A. Ballin, Jr., Southern Title Guaranty Company, Los Angeles. H. S. Swearingen of the Bureau of Right of Way and Land, Los Angeles, is treasurer.

In all great public and private improvement and development projects requiring the acquisition of easements, land sites and property, the right of way man has been an important behind-the-scenes participant. He has had to smooth the way for the engineer and the builder. He is the contact man, diplomatic good will advance agent and paver of ways.

Members of the Southern California Right of Way Agents' Association consider their work a profession and propose to dignify it as such. They plan to bring about a better understanding between property owners and right of way men, thus facilitating development undertakings whether they be the building of State highways, construction of railroads, creation of water, light and power projects or the laying of pipe lines.

The purpose of the association, as set forth in its constitution, is "to unite the efforts of all right of way men toward a betterment of conditions of the individual; to promote high standards and cooperative spirit among its members; to assist in creating a harmonious and friendly feeling between members and their respective employers; to engender in its members attributes which elevate the profession in which they are engaged.

Young Sign Vandals Turn Allies of the Division of Highways

By **I. G. THOMAS,** Office Engineer, District XI

THREE young boys, ages ten to twelve, were caught recently by an employee of District XI picking small reflector units from one of the highway reflectorized signs.

Believing that the boys did not realize the seriousness of removing these reflectors and desiring to impress upon them the grave consequences as well as to enlist their assistance in the future, a letter was addressed to each of the boys requesting them to report to the district engineer's office and explaining that failure to do so would mean turning their names in to the officers of the law. Promptly at the appointed hour the boys appeared, two of them accompanied by their parents.

The three of them were talked to directly, the parents being placed on the side lines to "listen in"; and "listen in" they did, for not one word was offered by them until the talk was over. However, it was apparent, before the talk had advanced far, that the boys had been taken in hand before coming to the district office.

It was thoroughly explained to the boys that these signs are placed along the highways to save and protect the lives of the motorists and that by removing the reflector units and defacing painted warning signs they might cause serious accidents.

It developed that the boys were members of a patriotic boys' organization and did not realize the seriousness of their actions. They have given their word of honor to do all they can to protect the signs and to report anyone found defacing them.

Thus we feel that the Division of Highways has gained some allies in the never-ending fight to keep our warning signs readable.

M STREET BRIDGE OPENING IN FALL

(Continued from page 18)

beautification work being done on the Yolo approach, that the contract work will cost nearly $950,000.

With the prospects of favorable construction weather for the next few months and with work continuing as at present, it appears that by October automobiles entering or leaving by Sacramento's western entrance will be able to use the new bridge.

In Memoriam

In the passing of JOHN C. MORE on April 17th, at Los Angeles, District VII of the Division of Highways not only lost one of its most valuable employees but also one of the most beloved and highly esteemed men in the organization.

"J. C.," as he was affectionately known by fellow workers, was one of the original employees of District VII, his name appearing on the February, 1912, pay roll as Chief of Party. He was employed continuously by the Division of Highways in the positions of Chief of Party, Resident Engineer, Superintendent, Assistant Division Engineer, and District Office Engineer, from 1912 until his death, with the exception of the time spent in the Army during the World War.

Mr. More was born May 9, 1882, at Grand Rapids, Michigan. He completed his education at the University of Michigan, where he was a member of the Delta Kappa Epsilon fraternity. Shortly after graduating, he came to Los Angeles, and was employed by the Rindge Estate as Engineer from 1905 to 1912. In February, 1912, he entered the employ of the California Highway Commission. From 1912 until the beginning of the World War he was engaged in highway location and construction work as Chief of Party and Resident Engineer.

Almost immediately after the war started, Mr. More was commissioned Captain of Engineers in one of the first regiments to see active service in France. On three different occasions he was decorated for bravery in action, receiving citations from both General Pershing and General Foch.

Returning from France in 1919 he reentered the employ of the California Highway Commission, and was soon promoted from Superintendent to Assistant Division Engineer, and then District Office Engineer, in which position he played an active part in State highway administration for a number of years.

All who came in contact with Mr. More had the highest regard for him, both personally and professionally. His many promotions attest to his years of efficient and loyal service to the State.

He was intensely interested in military affairs, being in the Officers' Reserve Corps for a number of years, and belonging to the Hollywood Post of the American Legion.

He is survived by his widow, Mildred S. More, and a brother, Edward E. More, both of Los Angeles, and a brother, Stoddard S. More, of Kalamazoo, Michigan.

"What is your occupation?"
"I used to be an organist."
"And why did you give it up?"
"The monkey died."—*Toronto Star.*

To a man returning home rather late, his wife said: "I suppose you've been sitting up holding a sick friend's hand."

"Not much," said the husband. "If I had held his hand, I wouldn't be broke."

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

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DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

CALIFORNIA STATE PRINTING OFFICE
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SACRAMENTO, 1935

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

Seattle Public Library

CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

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Scene on State Highway No. 1.
(Redwood Highway) North of Garberville

Official Journal of the Department of Public Works

JUNE 1935

...Seattle Public Library

1935

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Biennium Work 96 Per Cent Completed June 1st. 473 Projects Put Under Way

Construction Contracts for the Twenty-three Elapsed Months Total $38,093,300 Leaving Only an Estimated $1,453,600 to be Advertised for Bids by July 1st

By **GEORGE T. McCOY**, Assistant State Highway Engineer

IN THE recovery of the Nation from the pressure of unemployment and business stagnation, the State Division of Highways has accomplished its potential contribution to the cause during the past two years.

Recognizing the objective towards which the people of the United States are striving, the State of California and the Federal government have bent every effort to place revenues available for highways and related projects in circulation without undue loss of time.

GEORGE T. McCOY

With the current biennium, covering the period from July 1, 1933, to June 30, 1935, nearing its end, the Division of Highways has about completed a program of construction, reconstruction and maintenance for expenditure of available State and Federal funds in an orderly improvement of the State Highway System, Federal Highway System, connecting streets through municipalities and county feeder roads of traffic importance.

Early in 1933 the Federal government established a policy of providing intensive public works as a means of affording both direct and indirect employment on a large scale while at the same time producing permanent improvements on which dividends would be realized in the future.

As part of the National Industrial Recovery Act which Congress passed for carrying out this policy, provision was made for the appropriation of $400,000,000 as Federal aid to the several states for construction on State highway systems between July, 1933, and July, 1934.

This Federal assistance was continued for the fiscal year 1934–35 by congressional action in June, 1935, under the Hayden-Cartwright Act, which appropriated an additional $200,000,000 for the current fiscal year.

California's apportionment under the NIRA amounted to $15,607,354 and the 1935 apportionment of the Hayden-Cartwright Act provided $7,932,206.

This Federal money, totaling $23,539,560, when added to the $18,745,000 in State funds budgeted for highway construction made available to the Division of Highways the sum of $42,284,560 for major construction purposes on the 14,000 miles of the State Highway System, Federal Highway System, within municipalities and on county feeder roads.

However, in commenting on the expendi-

(Continued on page 14)

California Steel Girder Bridge Wins Award in National Beauty Contest

By **W. A. DOUGLASS**, Assistant Construction Engineer of Bridges

AS A UNIT of the San Francisco-Eureka Highway, crossing the South Fork of the Eel River, Humboldt County in 1919 designed and constructed a bridge across this fork of the river about six miles north of the Mendocino-Humboldt County line. Built of native redwood timber the bridge consisted of two 154-foot Howe truss spans and one hundred feet of timber trestle approaches.

Impending necessity for extensive repairs or possible failure of one or both truss spans together with the desirability of line improvement led to road and bridge contracts for the line change as shown on the accompanying sketch.

The old bridge and roadway, having been built to standards long since abandoned for primary routes, included sharp curves with radii as short as 70 feet and formed a real hazard and delay to present day traffic.

Construction of the realignment of this section of State Highway No. 1 with 20-foot hard surface and wide shoulders and the new bridge with 24-foot roadway was started in 1934 and completed early in 1935.

The accompanying pictures indicate the type of structure chosen for this site. Four continuous steel girder spans were used—two 120 foot each and two 100 foot each—which together with the abutment spans make a total length of 555 feet. The north one-half of the bridge lies on a curve.

UNUSUAL DESIGN

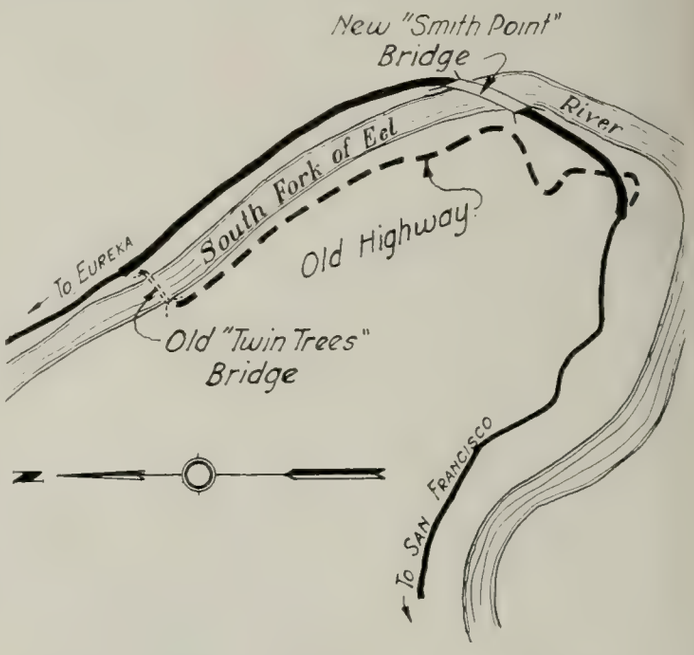
The design of this bridge is noteworthy for three reasons.

1. It is the second continuous girder steel bridge built on the State Highway system.

2. It is, so far as we know, the first continuous girder bridge on a curve built in this country.

3. It was awarded honorable mention on June 5th in the national annual competition held in New York by the American Institute of Steel Construction, Inc., for the most beautiful bridge in steel built last year.

Similar designs have been worked out and built in Germany but due to complications involved, this type of structure has not been developed in the United States.



MAP SHOWS LOCATION of new bridge at Smith Point on relocated highway relative to old structure across Eel River.

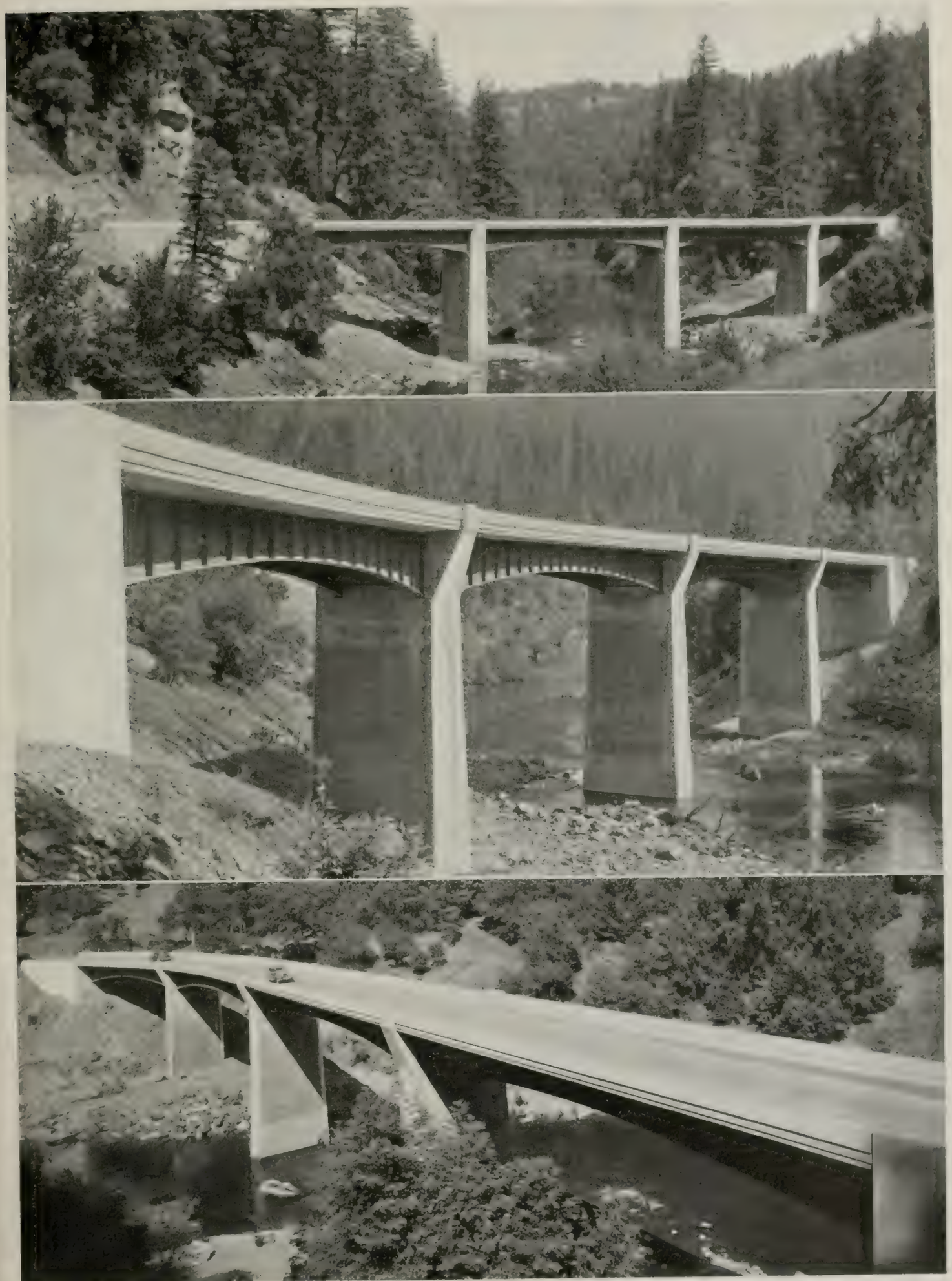
Since the steel girders are straight while the concrete deck slab is curved, the deck overhang beyond the girders is variable thus producing constantly changing conditions of loading and distribution throughout the entire lingth.

The effect of continuity or of continuous girder design is to carry stresses from one span to the next, in fact to several adjacent spans, reversing the stresses at each support. That is, a load tending to produce a sag in one span will tend to produce a raise or crown in the first span on either side and a lesser sag in the second spans, crown in third and so on thus producing "waves" decreasing in magnitude each way from the loaded span.

The extent and direction of the stresses developed in bridge members and joints have been fairly well developed for bridges on tangent. However it can be readily seen that, with a bridge on a curve and the girders joined at an angle rather than a line, the effect of stresses carried through the joints may be quite different.

In addition to the "wave" effect mentioned above, a load on one span introduces an overturning moment in the girders of adjacent

(Continued on page 19)



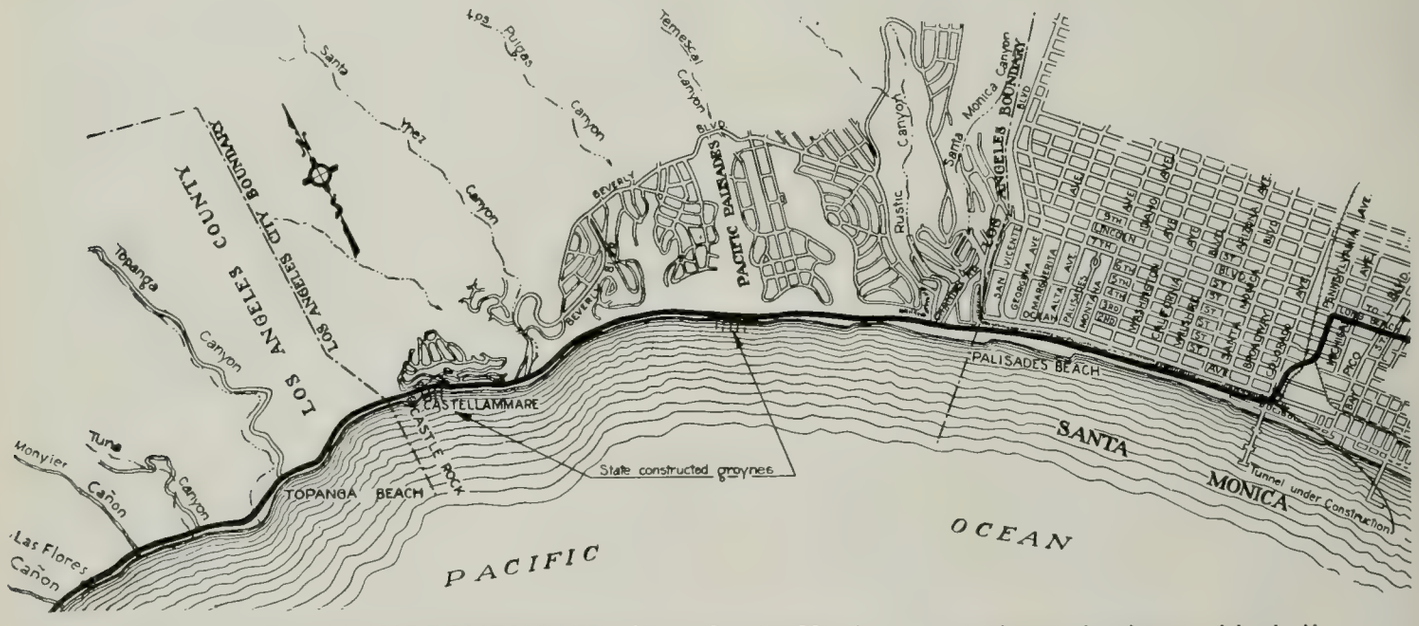
BEAUTY AWARD WINNER in a bridge contest and not a card game, is this State designed structure on the Redwood Highway where it crosses the South Fork of the Eel River just south of Garberville. It is the first continuous steel girder bridge built on a curve in America and was awarded honorable mention in a national competition for the most beautiful steel bridge built last year.

Last Unit of $1,235,000 Coast Highway Project Under Way at Santa Monica

AN EXTENSIVE program begun in 1932 for improving the Coast Highway through the great recreational beach area in the vicinity of Santa Monica, entered its final stage of construction with the recent award of contracts for a tunnel and roadway connecting the shoreline section with Lincoln Boulevard in the city of Santa Monica.

The improvement program involved the widening of the existing 20-foot Coast Highway and the construction of connecting links in Santa Monica to provide a broad, paved coastal roadway stretching from Las Flores Canyon on the north to Lincoln Boulevard on the south.

Los Angeles is famed for its beaches, and on week ends and holidays probably one-quarter million people visit those at Santa Monica and the beaches stretching northerly to Las Flores Canyon. A 16-hour traffic count taken on the old 20-foot pavement at Santa Ynez Canyon on July 4, 1929, was 53,303 vehicles.



MAP OF HIGHWAY IMPROVEMENT along Santa Monica coast shown by heavy black line.

The total length of the project is 11.35 miles and includes 11 contracts at a total cost of approximately $1,235,000 excluding right of way.

The design of the highway was based on the necessity of handling a very large flow of traffic, especially on week ends and holidays, which comes into the beach area over every road and thoroughfare leading from and through the metropolitan area of Los Angeles.

PARKING AREA PROVIDED

Over much of the distance between Las Flores Canyon and Santa Monica, in order to provide an adequate width of roadway, it has been necessary to grade the fills extending to the ocean on the one side with the cuts biting into the cliffs or palisades on the land side. As much parking area as possible, outside of the actual traveled way, has thus been provided for the large number seeking recreation at the beaches.

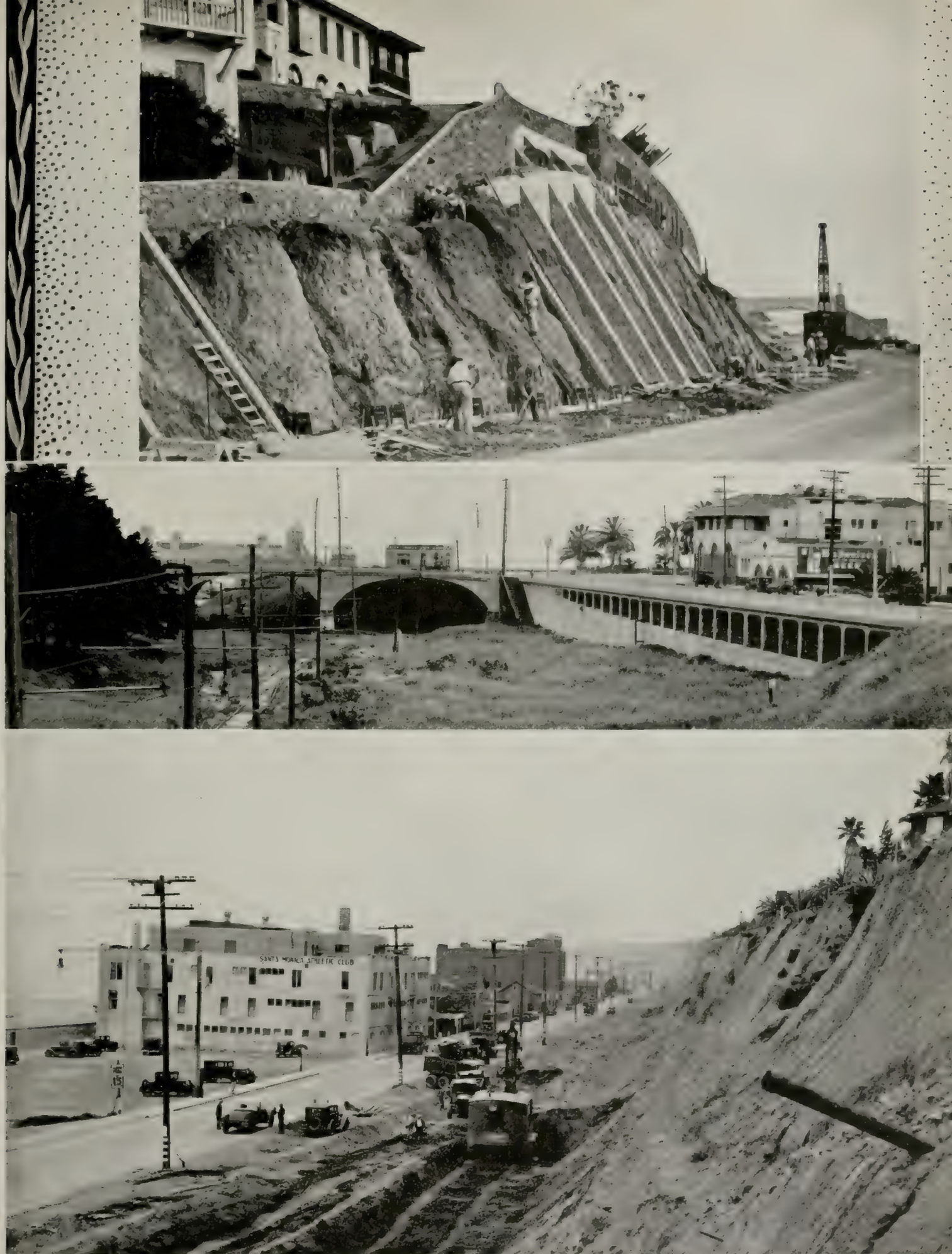
This was the largest traffic count ever taken on a State highway in California.

TRAFFIC CONDITIONS IMPROVED

Building a road in this manner between the cliffs and the ocean resulted in a huge excess of excavated material. The excess was used to widen the highway embankment and provide additional parking areas outside of the highway proper, which accommodate capacity crowds on holidays and greatly contribute to safe traffic conditions.

The new roadbed is graded throughout to an 80-foot width and is paved with asphalt concrete or portland cement concrete 40 feet

(Continued on page 22)



SANTA MONICA COAST HIGHWAY extension and widening operations—In the top picture workmen are constructing reinforced concrete slope protection for retaining walls that support walks and roadways on private property. Center picture shows a portion of the old Southern Pacific Railroad right of way through which the highway will be extended from the shoreline to Lincoln Boulevard by open cut and construction of a 400-foot reinforced concrete arch tunnel under Ocean Avenue and Colorado Avenue in Santa Monica. The tunnel will have a clear span of 56 feet and 48-foot roadway with sidewalks. In the lower picture steam shovel equipment is widening the right of way where the shoreline highway, at its lower end, starts to swing through the cut and tunnel and over Pennsylvania Avenue to the connection with Lincoln Boulevard.

Governor Merriam Dedicates Redwood Highway Link Eliminating 96 Curves

By **J. W. VICKREY,** District Engineer

IN A MINIATURE forest of Redwoods set up on the main thoroughfare of the little town of Garberville and accompanied by picturesque ceremonial pageantry Governor Frank F. Merriam, on June 9th, officially opened and dedicated the new seven mile Benbow-Garberville unit of the Redwood Highway reconstructed at a cost of $450,000, which eliminates a dangerous and obsolete section of roadway, saves approximately one-half mile in distance and straightens out 96 curves.

Elaborate arrangements were made by the Garberville Chamber of Commerce and the Humboldt County Board of Trade, sponsors of the event which began with an official luncheon at Benbow Inn attended by Governor Merriam as guest of honor, State and county officials, and representatives of various civic associations.

Governor Merriam's official party included: Director of Public Works Earl Lee Kelly; Assistant Director Justus F. Craemer; California Highway Commissioners Ray Ingels and Timothy A. Reardon; the Commission's secretary, Julien D. Roussel; Senator Harry A. Perry and Assemblyman Michael Burns of Humboldt County; James Snook, Chief of Division of State Parks; Construction Engineer C. S. Pope of the Division of Highways and District Engineer J. W. Vickrey.

PICTURESQUE CEREMONY marked the ribbon-cutting scene at the dedication of the Benbow-Garberville unit of the Redwood Highway relocation project. Left to right, the State officials in the group are: Senator H. A. Perry; Highway Commission Secretary Julien D. Roussel; Commissioner T. A. Reardon; Governor Merriam; Director of Public Works Earl Lee Kelly; Assistant Director Justus F. Craemer; Commissioner Ray Ingels.

Following luncheon, the official caravan

(Continued on page 18)

REDWOOD HIGHWAY SCENES along the South Fork of the Eel River in Humboldt County, where seven miles of highway between Benbow and the Redway Bluffs north of Garberville have been reconstructed at a cost of $450,000 and numerous curves eliminated or straightened.

BEAUTIFUL SCENIC VISTAS of redwood forests, canyon-like valleys and silver reaches of the winding river several hundred feet below mark that part of the new highway along the percipitous Redway Bluffs where much new heavy grading was necessary in widening and straightening this once dangerous section of the road. Through the redwood forests the new highway was constructed to harmonize with the natural scenery. Native redwood logs were used for cribbing, retaining walls, trench backfill, and in embankments, thus preserving the rustic atmosphere of that part of the project.

$5,291,693 Gas Tax Funds Apportioned to Cities During 1933-35 Biennium

By **L. V. CAMPBELL,** Engineer of City and Cooperative Projects

THE Department of Public Works recently completed the apportionment of $5,291,693.72 of gas tax revenue to cities for the biennium ending June 30, 1935. The allocation, or cities' share, made in accordance with legislation enacted in 1933, represents the net revenue derived from one-quarter cent per gallon tax on motor vehicle fuel.

The apportionment to each city was made, as prescribed in Chapter 767, Statutes of 1933, on a population basis in the proportion that the total population of each city bears to the total population in all cities in the State, as determined by the last Federal census of 1930.

L. V. CAMPBELL

Five cities in the State, namely: Bayshore in San Mateo County, Fairfax in Marin County, Gardena in Los Angeles County, Indio in Riverside County, and Westmorland in Imperial County, although municipalities, were incorporated subsequent to the last decennial federal census, which, under the terms of the one-quarter cent gas tax allocation law, precluded their participating in the funds allocated for the current biennium. This condition has been corrected recently by the legislature and such cities will participate in future gas tax apportionments, commencing with the July apportionment for the 1935–37 biennium.

Gas tax money is allocated to municipalities for expenditure upon State highway routes and city streets within incorporated cities. This money has been used to some extent for the maintenance of State highway routes and other city streets within municipalities. By far the greater portion of the money, however, has been used for the improvement of the principal thoroughfares.

SECURED HIGHWAY IMPROVEMENTS

Many cities continued to maintain the State highway routes within their limits with city forces, defraying the cost from city funds, and applying the entire amount of the gas tax allocation toward improvement of the highways. In the comparatively short time that the act allocating gas tax revenue to cities has been operative, a noticeable improvement of the State highway routes through cities has resulted from the expenditure of these funds.

The work accomplished and under way, in addition to maintenance work, consists of widening narrow pavements, moving back curbs and gutters to provide a wider street, resurfacing rough pavements to provide a smooth riding surface, realigning and straightening crooked tortuous streets and sharp turns, acquiring and opening new routings, and placing new pavements.

Many cities where funds are insufficient for immediate accomplishment of improvements have undertaken stage construction with right of way acquisition as the initial project, or are accumulating funds for future construction.

CITIES RECEIVING FUNDS

Following is a list of the incorporated cities, giving the symbol or abbreviation for each city, the county abbreviation, the Division of Highways district in which the city is located, the population according to the 1930 Federal census, and the total apportionment of gas tax funds to the city for the 1933–35 biennium:

WEST ENTRANCE TO RIVERSIDE as realigned eliminating right angle turn, graded and paved with $12,769 of gas tax funds and $10,000 from State Cooperative fund.

APPORTIONMENT OF ONE-FOURTH CENT GAS TAX TO CITIES FOR BIENNIUM ENDING JUNE, 1935

District	City or town	Symbol	County	Abbreviation	Population	Total allocation
IV	Alameda	Ala	Alameda	Ala	35,033	$43,458 55
IV	Albany	Alb	Alameda	Ala	8,569	10,629 87
VII	Alhambra	Alh	Los Angeles	L.A.	29,472	36,560 11
II	Alturas	Alt	Modoc	Mod	2,338	2,900 30
IV	Alviso	Alvs	Santa Clara	S.Cl.	381	472 63
X	Amador City	Ama	Amador	Ama	171	212 13
VII	Anaheim	Ana	Orange	Ora	10,995	13,639 33
X	Angels	Ang	Calaveras	Cal	915	1,135 06
IV	Antioch	Ant	Contra Costa	C.C.	3,563	4,419 91
VII	Arcadia	Ada	Los Angeles	L.A.	5,216	6,470 46
I	Arcata	Arc	Humboldt	Hum	1,709	2,120 02
V	Arroyo Grande	Ar.Gd.	San Luis Obispo	S.L.O.	892	1,106 53
IV	Atherton	Atn	San Mateo	S.M.	1,324	1,642 43
X	Atwater	Atw	Merced	Mer	917	1,137 54
III	Auburn	Aub	Placer	Pla	2,661	3,300 98
VII	Avalon	Ava	Los Angeles	L.A.	1,897	2,353 23
VII	Azusa	Azu	Los Angeles	L.A.	4,808	5,964 34
VI	Bakersfield	Bkd	Kern	Ker	26,015	32,271 69
VIII	Banning	Ban	Riverside	Riv	2,752	3,413 87
VIII	Beaumont	Bau	Riverside	Riv	1,332	1,652 35
IV	Bay Shore	By.Sh.	San Mateo	S.M.		
VII	Bell	Bell	Los Angeles	L.A.	7,884	9,780 13
IV	Belmont	Bmt	San Mateo	S.M.	984	1,220 65
IV	Belvedere	Blv	Marin	Mrn	500	620 25
X	Benicia	Ben	Solano	Sol	2,913	3,613 59
IV	Berkeley	Ber	Alameda	Ala	82,109	101,856 47
VII	Beverly Hills	Bv.Hs.	Los Angeles	L.A.	17,429	21,620 73
III	Biggs	Big	Butte	But	463	574 35
IX	Bishop	Bis	Inyo	Iny	1,159	1,437 74
I	Blue Lake	B.Lk.	Humboldt	Hum	555	688 48
XI	Blythe	Bly	Riverside	Riv	1,020	1,265 31
XI	Brawley	Brw	Imperial	Imp	10,439	12,949 61
VII	Brea	Bre	Orange	Ora	2,435	3,020 62
VII	Burbank	Brb	Los Angeles	L.A.	16,662	20,669 26
IV	Burlingame	Burl	San Mateo	S.M.	13,270	16,461 48
XI	Calexico	Clx	Imperial	Imp	6,299	7,813 93

(Continued on page 26)

Ray Ingels Takes Office as Member of California Highway Commission

RAY INGELS of Mendocino County, former representative of that county in both houses of the State Legislature, has been appointed a member of the California Highway Commission by Governor Frank F. Merriam.

Always a booster for good roads and a supporter of the Department of Public Works throughout his public career, Mr. Ingels, while Senator became closely acquainted with Governor Merriam, then Lieutenant Governor, who announced his appointment to the commission on May 21st, to succeed Dr. W. W. Barham. The office carries no salary.

SIX YEARS A LEGISLATOR

As a member of the Assembly for two years and for an additional four years as a member of the Senate, Mr. Ingels obtained a rare and valued knowledge of conditions throughout the State.

Born in Indiana in the year 1890, Mr. Ingels came to California with his parents in 1903 and settled in Fresno. He graduated from the high school of that city in 1909. Entering the University of California the same year he graduated with the class of 1913, College of Agriculture.

SERVED IN THE ARMY

Ranch foreman in Kern County and Butte County; Extension Specialist with the University of California; head of the Real Estate Department of the Union Trust Co. were successive positions held by Mr. Ingels during the next four years.

In 1917 when the United States declared war against Germany Mr. Ingels enlisted in the artillery branch of the U. S. Army. He worked his way up from private to first lieutenant and the close of the war found him commanding a battery in the officers' training school at Camp Taylor, Kentucky.

PREFERS RANCHING BUSINESS

Since the close of the war, Mr. Ingels has pursued his chosen profession of ranching in Potter Valley, Mendocino County. In 1928 he decided to enter politics and in that year ran for and was elected to the Assembly, representing Mendocino County. In 1930 he was elected to the Senate to represent Mendocino and Lake Counties.

RAY INGELS

Declaring that he desired to withdraw from public life he declined to again enter the contest for reelection to Senate in the 1934 campaign.

POOR ROADS COST MOTORISTS $1,500,000,000 ANNUALLY

High driving costs due to poor roads vastly swell the highway transportation bill, says an engineering authority. American motorists annually travel more than 200 billion miles. Naturally the good roads and streets in service have largely reduced car driving costs. Yet conservatively estimating excessive driving costs on the poor roads and streets at one cent a mile, motorists yearly spend $1,500,000,000 in excess of what they would pay if the bulk of them were provided with traffic facilities better suited to the motor vehicle.

That continued highway improvement at an accelerated rate would pay for itself is indicated by the fact that the costs of driving cars today is probably more than one-third less than it was 15 years ago when good road building got under way.

PROVIDING RAIL TRANSPORTATION for the San Francisco-Oakland Bay Bridge, Governor Frank F. Merriam signs the bill empowering the Toll Bridge Authority to contract for the operation of trains across the 8¼-mile structure. Seated, left to right are: Finance Director A. E. Stockburger, Governor Merriam and Lieutenant Governor George J. Hatfield. Standing are: Florence J. McAuliffe, Bay Bridge attorney; Chief Engineer C. H. Purcell, Assemblyman Gardiner Johnson of Berkeley, Senator William F. Knowland of Alameda County, and Assemblyman Thomas A. Maloney of San Francisco.

Governor Signs Bay Bridge Trains Bill

With officials of the Department of Public Works, the California Toll Bridge Authority, Department of Finance, Division of Highways and members of the San Francisco, Alameda and Contra Costa County legislative delegations looking on, Governor Frank F. Merriam on May 27th signed A. B. 947, the important permissive measure providing that the Toll Bridge Authority may permit and in the future acquire rail transportation on the San Francisco-Oakland Bay Bridge.

Under this bill, the Toll Bridge Authority is authorized to enter into contracts for the operation of trains on the bay bridge.

Witnessing the signing of the measure were Lieutenant Governor George J. Hatfield, Assemblymen Melvyn I. Cronin, Jefferson Peyser, Patrick J. McMurray, Ray Williamson, James F. Brennan, William B. Hornblower, Thomas Maloney and Joseph P. Gilmore of San Francisco; Senators William F. Knowland, Alameda, and William R. Sharkey, Contra Costa; Assemblymen Charles W. Fisher, Charles J. Wagner, Arthur H. Breed, Jr., Gardiner Johnson, Henry P. Meehan and James M. Cassidy, Alameda County; Assemblyman T. H. DeLap, Contra Costa.

Representing State departments were Deputy Director of Public Works E. J. Neron; State Highway Engineer and Bay Bridge Chief Engineer C. H. Purcell; Florence J. McAuliffe, attorney for the Toll Bridge Authority; Director of Finance A. E. Stockburger; Julien D. Roussel, secretary State Highway Commission; Harold Norton, Department of Public Works; C. C. Carleton, Chief of Division of Rights of Way.

MAN-YEAR COST IN ENGLAND

In England, it is estimated that the direct cost per man-year on public works is about $1,750. An expenditure of $7,500 is calculated to employ four men directly on the site and six men indirectly in the materials, plant, and transport work, a total employment of ten men at a cost of $750 per man-year.

"Hello, Totz, how are you?"

"Not so good—I have indigestion."

"How come?"

"Bought and ate an unemployed apple and it started to work."

A judge gave an Oregon grocer who beat up a government inspector a chance to defend himself. The grocer said:

"I'm guilty. I lost my head. All the morning I held my temper while government agents inspected my scales, tasted my butter, smelled my meat, graded my kerosene. Then this bird comes along and wants to take moving pictures of my cheese. It was more than I could stand—I pasted him in the eye."

Monterey Park Celebrates Completion of Los Angeles-Pomona Highway Link

By **R. C. MYERS,** Assistant District Office Engineer

AS THE CLIMAX to a five-day celebration in the city of Monterey Park, the new State highway improvement of Garvey Avenue through the city was officially dedicated on the afternoon of May 25th by Assistant Director of Public Works Justus F. Craemer and other State and county officials.

An extensive parade was held through the streets of Monterey Park and ended at a specially built platform where Mayor Williams introduced Mr. Craemer and the other speakers.

In addition to Mr. Craemer addresses were made by District Engineer S. V. Cortelyou and District Right of Way Agent Frank C. Balfour of the Division of Highways, by Chairman H. C. Legg of the Los Angeles County board of supervisors and various city officials.

As explained by the speakers, the improvement of Garvey Avenue through Monterey Park is an important link in the new Los Angeles-Pomona highway by which traffic entering Los Angeles from the east can travel nearly to the Civic Center of Los Angeles without the usual interruptions of intersecting streets or railroads crossing at grade.

PROVIDES 76-FOOT ROADWAY

The link from Atlantic Boulevard to New Avenue along which the dedication ceremony was held, is 1.49 miles in length and, through the business district of Monterey Park, is paved the full 76 foot width between curbs. For the five blocks through the business section the existing curbs were left in place on the north side and new curbs constructed on the south side to provide the 76 foot width of roadway.

On each side of the business district curbs and gutters were constructed throughout on the south side of Garvey Avenue and the areas between the edges of pavement and gutter were oil treated.

Work under this contract was started last January and completed May 6, 1935, at a cost of $43,380 under Resident Engineer C. P. Montgomery of the Division of Highways.

Just previous to the completion of the contract through Monterey Park work was finished on the last construction contract on Ramona Boulevard, which includes the portion of this route in the city of Los Angeles.

SOME DIFFICULT CONSTRUCTION

Started more than a year ago, and completed last April, this Ramona Boulevard link carries the route from State Street to its present terminus at Aliso Street and Mission Road near the Civic Center of Los Angeles. From this point traffic has access to the Civic Center via Aliso Street, which is a wide paved thoroughfare.

This last contract on Ramona Boulevard, while only 0.96 mile in length, was one of the most difficult from a construction standpoint of any on the entire route between Los Angeles and Pomona. A natural drainage channel (Arroyo de las Posas) paralleled the project for its entire length and carried a large volume of drainage water during heavy rains from a considerable area lying northeast of Los Angeles.

DRAINAGE CANAL BUILT

A drainage canal lined with gunite and capable of carrying the flow of water from this source, with an ample factor of safety for exceptional rains, was constructed between the highway and the Pacific Electric Railway tracks, which parallels the highway. Curbs and heavy cable guard rail were built to protect traffic from the hazard of running into this ditch.

A new concrete pavement 40 feet wide was constructed with a 12-foot oiled shoulder on each side, making a width of traveled way of 64 feet. This can be widened in the future by covering the storm drain.

The location of the route through this part of Los Angeles was restricted to the space between the Pacific Electric Railway tracks and very steep and high bluffs. Homes on the bluffs made it necessary to use extreme care in the excavation for the wide roadbed.

FINAL CONTRACT LET

All important intersecting streets are carried over the new highway on overhead bridges so that from Aliso Street and Mission

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RAMONA BOULEVARD UNIT of the Los Angeles-Pomona airline arterial, presented some difficult construction between State Street and Mission Road, restricted for most of the distance between the railroad, a natural drainage channel and high bluffs, and passing under bridges carrying intersecting highways. A gunnite lined canal was constructed for the drainage channel.

Biennial Budget 96 Per Cent Awarded

(Continued from page 1)

ture during this biennium, it must be borne in mind that the requirements far exceed the available funds. These requirements are based on the amount of traffic, and the necessity for replacement of existing facilities on which the investment has been amortized and on which the maintenance costs are excessive and justify replacement.

Another factor for consideration is the addition of 6800 miles of county roads by act of the State Legislature of 1933. The major part of this mileage was constructed on standards and alignment far below that required by present day traffic and included many bridges which are structurally unsound, necessitating temporary repairs or posting for reduced legal load and speed limits.

The bringing of these roads up to a standard adequate for the accommodation of existing and anticipated traffic is an obligation of the State to be undertaken as funds become available.

With the funds available the Division of Highways has expended every effort to place the work under contract and the results are evidenced by a review of the period since July 1, 1933.

With twenty-three of the twenty-four months of the biennium elapsed, projects amounting to $40,830,900, or 96 per cent of the $42,284,000 budget, have been awarded as contracts or are now advertised for bids, leaving only $1,453,600 or 4 per cent to be advertised by July first, and, with the present speed of advertising continued, this will be accomplished.

The following summations set forth in tabular form the figures given above:

CONSTRUCTION AND MAINTENANCE BUDGET

Construction:		
State funds	$18,745,000	
NIRA apportionment	15,607,354	
Subtotal (legislative budget)	$34,352,354	
Hayden-Cartwright Act apportionment	7,932,206	
Total construction budget		$42,284,560
Maintenance and Betterments (legislative budget)		17,722,000
Total		$60,006,560

STATUS OF CONSTRUCTION AND MAINTENANCE JUNE 1, 1935

Construction put under way	$38,093,300	
Expenditures for construction rights of way in cities	1,855,100	
Projects advertised for bids	882,500	
Subtotal		$40,830,900
Maintenance and Betterment allotments		16,446,800
Subtotal		$57,277,700
Construction to be advertised	$1,453,660	
Maintenance funds remaining	1,275,200	
Subtotal		2,728,860
Total		$60,006,560

Progress on highway maintenance during the biennium has paralleled that of construction and on June first maintenance work orders amounting to approximately $16,446,800 had been written leaving only some $1,275,200 of the $17,722,000 originally budgeted for maintenance and betterments during the biennium.

That the State Highway System, with its 14,000 miles of interlacing routes, is one of California's greatest assets, is an indisputable fact and the increase made in the last two years in the permanent value of the system to the citizens of the State may best be judged from the following summary of construction put under way and advertised since July 1, 1933.

Types of Improvement	Miles	Amount
Pavement	322.6	$13,643,600
Bituminous treated crushed rock surfacing	281.6	5,336,700
Untreated crushed rock surfacing	71.3	1,086,800
Graded roadbed	242.8	6,375,700
Oiled roadbed and oiled shoulders	2299.1	1,668,200
Bridges and grade separations	(149)	7,232,500
Miscellaneous contracts	-----	918,200
Minor improvements	-----	759,400
Miscellaneous day labor	-----	1,954,700
Expenditures from construction funds for rights of way on State routes in cities		1,855,100
Totals		$40,830,900

The advancement of this large construction program has required the persistent and unified effort of the entire State highway organization. However, a contributing factor has been the realization that this accomplishment is not only adding to the wealth of the

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VERY FAIR INDEED was this meeting of Governor Merriam and the fair little Mary Catherine Taylor when she invited him to come to "our party" at San Diego. Left to right, Director of Finance A. E. Stockburger, Governor Merriam, Director of Public Works Earl Lee Kelly, Mary Catherine Taylor, her mother Mrs. Taylor and Senator Ed Fletcher, her grandfather.

Little Lady Bids Governor to "Party"

Proudly bearing an envelope almost as long as she, herself, is tall, enclosed in which was the official invitation of the California Pacific International Exposition to Governor Frank F. Merriam to attend the World's Fair opening in San Diego, May 29, little Miss Mary Catherine Taylor, eight years old, called upon the Governor in the Capitol.

As the special representative of Frank Belcher, President of the Exposition, the diminutive lass presented the invitation to the State's chief executive. Written in her own handwriting, it read:

"Dear Governor Frank:

Please come to our party. Everybody in America is coming.

Always yours,

MARY CATHERINE TAYLOR,
Special representative of the President of the California Pacific International Exposition."

Accompanied by her mother, Mrs. B. H. Taylor of San Diego, and escorted by her grandfather, Colonel Ed Fletcher, State Senator from the Exposition City, Miss Taylor was ceremoniously received by Governor Merriam in the gubernatorial office on May 21st. The invitational document, embellished with a huge colored seal of the Exposition drawn by Mary Catherine, is three feet long and two feet wide.

CITY POPULATION AVERAGES 235 PER MILE OF STREET

Approximately 3300 miles of streets in California cities of under 50,000 population are available to serve an additional population of 786,000 people, or 47 per cent more persons than now are served.

This is one of the interesting facts developed by the road transportation survey made by the Division of Highways. Statistics on the relation between population and road mileage show that the average population per mile of street for all cities of the State is 235.

Kennett Dam Project Entails Rebuilding 16 Miles of Highway, 37 Miles Railroad

By **F. N. DRINKHALL,** District Locating Engineer

CONSTRUCTION of the proposed Kennett Dam will necessitate the rebuilding of some 16 miles of State Highway Route No. 3 (U. S. 99) in Shasta County and approximately 37 miles of the Southern Pacific Railway.

Preliminary surveys for the relocation of both highway and railroad began in February of this year, and field work on both surveys was practically complete by June 1st. Plans and estimates are in progress.

For the past year or more the Division of Water Resources and the U. S. Geological Survey have had parties in the field contouring the entire area covered by this project. From the data obtained, contour maps on a 20-foot interval were made and placed at the disposal of both highway and railway officials.

TWO POSSIBLE ROUTINGS

These maps permitted an intelligent study of re-routing possibilities prior to actual field work. They were of great help, particularly to the railway company, as their grades stayed within the contour limits of the maps. In our own case it permitted a study of two possible highway routings—one, in general, along the shore line of the proposed lake on easy grades, the other a direct route using grades up to 6 per cent.

The largest single construction item in the relocation of both highway and railroad is a 3200-foot bridge across Pit River, and, as its location could seriously affect both line and grade, it was our first problem. Tentative crossings were placed on the contour maps, and field inspection of the sites followed.

While alignment requirements practically forced the adoption of one particular site, it was decided to call for expert advice on the geological and foundation merits of two possible sites, one above, the other below the present highway crossing of Pit River, before adopting a definite site and proceeding with surveys.

A joint field investigation was made by Chester Marliave, geologist of the Division of Water Resources, and C. J. Sielaff, geologist for the Southern Pacific Company, and separate reports made thereon. Their findings indicated that the downstream site, tentatively adopted because of alignment requirements, was suitable from a geological standpoint.

SUITABLE FOUNDATION EXISTS

To quote from Mr. Marliave's report, "There are no major structural weaknesses. Suitable foundation rock exists that when properly prepared, will safely withstand the loads to which it will be subjected and which will not deteriorate by continual submergences in water." The formation is described as "a massive ridge of granite" or "quartz hornblende diorite."

This bridge will be a joint structure carrying the railway below and highway above. Its overall length will be approximately 3500 feet, including structure approaches for the highway, necessitated because of railway interference. Highway grade will be about 477 feet above river bed and 395 feet above the grade of the present highway bridge across this river.

As noted above, there are two possible general policies as to re-routing the highway, one to use easy grades and stay on the slopes above the proposed lake, the other to use up to 6 per cent grades to climb up into easier country and take out distance. The first had scenic possibilities with less rise and fall, and merited investigation, at least. Our first preliminary lines were run with this object in view but were eventually abandoned as too costly.

SATURATED AREA AVOIDED

The minimum curvature we had adopted had to be dropped and pieces of maximum grade introduced to turn and cut through knife-edged ridges. One string of 600-foot radius curves introduced fills of 250,000 cubic yards hanging on 29° slopes, with a large part of their free area below the water surface. Enough of line was run on this basis to provide a convincing comparison with the adopted route.

NEW BRIDGE SITE across the Pit River for the proposed joint highway and railroad bridge made necessary by the Kennett Dam project is indicated by the white line, 325 feet higher than present bridge shown in background.

RELIEF SKETCH MAP by Paul Green and Bart. Dunn of District II shows proposed relocation of State highway and railroad in Kennett Dam and lake area. Existing highway is shown by dotted line.

As against this questionable type of construction, use of 6 per cent grade, starting at the north end of the proposed Pit River bridge, quickly took the line out of the saturated area up into easier country where better alignment was possible. While this necessitated taking higher summits, the total rise and fall in the revision is 372 feet less than the existing highway, and a saving of 3.2 miles in distance is secured. Shore line sur-

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Highway Dedicated With Pageantry

(Continued from page 6)

proceeded to a large tree-embowered grandstand erected on the roadside in the heart of Garberville where Governor Merriam performed the dedication ceremonies of cutting the ribbon barrier and made the principal address of the day to a large crowd of assembled citizens.

The crowning feature of the program was a spectacular pageant featuring Indian characters resplendent in native costumes and a score of beautiful Humboldt County girls garbed to represent the various recreational activities of the Redwood Empire and particularly Humboldt County.

The first State highway was constructed through this area twenty years ago. It was very crooked and narrow as compared with present day requirements, but at that time was considered a very high type of road and a substantial improvement to the locality.

It opened up territory that had never before been accessible except to those traveling by foot or horseback and was the transportation route by which the potential recreational value of a then sparsely settled section of California has been realized. As the recreational value of this section became better and wider known, traffic increased rapidly and the original constructed highway has for several years been inadequate for present day traffic.

BEAUTIFUL SCENIC VISTAS

The new highway was designed and has been constructed so as to harmonize with the natural scenic beauties of the territory, parking turn-outs being constructed at several locations where particularly pleasant panoramic vistas of the forests and canyon-like valleys are obtained. Noteworthy among these is the magnificent view of Garberville where the South Fork of Eel River lying several hundred feet below the highway makes a bend to the west and partly surrounds a beautiful cattle ranch of early day origin. Another is the view from high up on Redway Bluffs down the canyon of Eel River as it follows its meandering course to the Pacific Ocean.

The project was constructed in two sections, one extending northerly from Benbow at the mouth of the east branch of the South Fork of Eel River over the so-called Benbow Summit into Garberville, a thriving little town located high above a beautiful section of the river.

THROUGH REDWOOD GROVE

The northerly section of the new construction work commenced at Bluff Creek, a point approximately one mile north of Garberville, and extended through a rolling, lightly wooded area to Redway Bluffs, a sandstone cliff where very heavy grading work was required to obtain a satisfactory standard of alignment. Immediately north of these bluffs the new highway passes through the beautiful Holbrook Grove, one of the many State Redwood Parks in this area, and continues northerly for five miles along the east bank of the South Fork of Eel River.

The road for its entire length passes through one of those areas frequently encountered in the Coast Range where the material slides when either wet or dry, and many large slides and embankment failures occurred during the construction. At Benbow Summit the ground above a 50-foot cut broke back for a distance of from 400 to 500 feet and a large area of the mountain side, comprising several acres, gradually moved toward the roadway.

Over 100,000 cubic yards of this moving material were removed along benches at an elevation from twenty to thirty feet above the road bed. A portion of the material was used to reconstruct a large embankment immediately to the south which had failed and the remainder was deposited in terraces on the adjoining property, a safe distance from the roadway.

REDWOOD TIMBER USED

One of the most interesting features of the construction work was the use of native redwood timber for cribbing, retaining walls, trench backfill and in embankments. The disposition of redwood timber cut during highway construction work has heretofore presented a very difficult problem, it being practically impossible to burn green redwood and there is no commercial market in isolated districts.

"And this is your bump of curiosity."

"Right, Professor. I got that by sticking my head in the elevator shaft to see if the elevator was going up. It was coming down."

EARLY SPANISH in its architectural style, the new district office building of the Division of Highways in San Diego is of concrete construction, 115 feet long by 116 feet wide with a two story corner tower. Designed by the Division of Architecture of the State Department of Public Works.

New Highway Office Building in San Diego

A NEW office building for District XI of the State Division of Highways is under construction and nearing completion in the City of San Diego. It is located at the corner of Harbor and Ash streets, facing the site of the proposed new Civic Center Group and having, as well, a view towards the water front. The lot is 125 feet wide by 200 feet long.

The style of architecture of the building was chosen with the idea of harmonizing with the projected development and is of a simple Early Spanish type, adopted to modern needs. In the main the structure is one-story in height, accented at the corner by a tower, which also acts as an entrance feature.

The building is of Class "C" construction with exterior walls of concrete while the interior partitions and roof framing are of wood.

The floor plan is roughly "U" shaped being 150 feet long and 116 feet wide.

On the ground floor are nine offices, a public waiting room, blue print room, accounting room, vault and a large drafting room.

The second floor of the tower is used as a conference room and overflow drafting room.

In the basement are a laboratory, store room and heater room.

The magician's wife knew he was up to his old tricks because she discovered a hare on his shoulder.

Smith Point Bridge Wins Contest Award

(Continued from page 2)

spans and because of the restraint a tortional or twisting stress is developed at the joints.

This is one phase of design on which very little has been written and no definite rules developed. For this reason individual credit is due Designing Engineer H. D. Stover and Designer A. B. Willett for the ingenuity displayed in developing a rational solution for this problem.

The principal advantages of this type of design are in the use of longer girder spans, some reduction in metal required and pleasing appearance. Further embellishments were added for appearance such as the distinct form marks on piers and abutments, massive abutments and solid concrete rails.

The cost of bridge was about $110,000, or nearly $8.00 per square foot of roadway. The relatively high cost was due in a large measure to high (75 foot) piers required.

The news that this bridge had won an award in a national contest came in a letter from F. H. Frankland, technical director of the American Institute of Steel Construction, Inc., of New York under date of June 5, advising that it was awarded honorable mention in Class C.

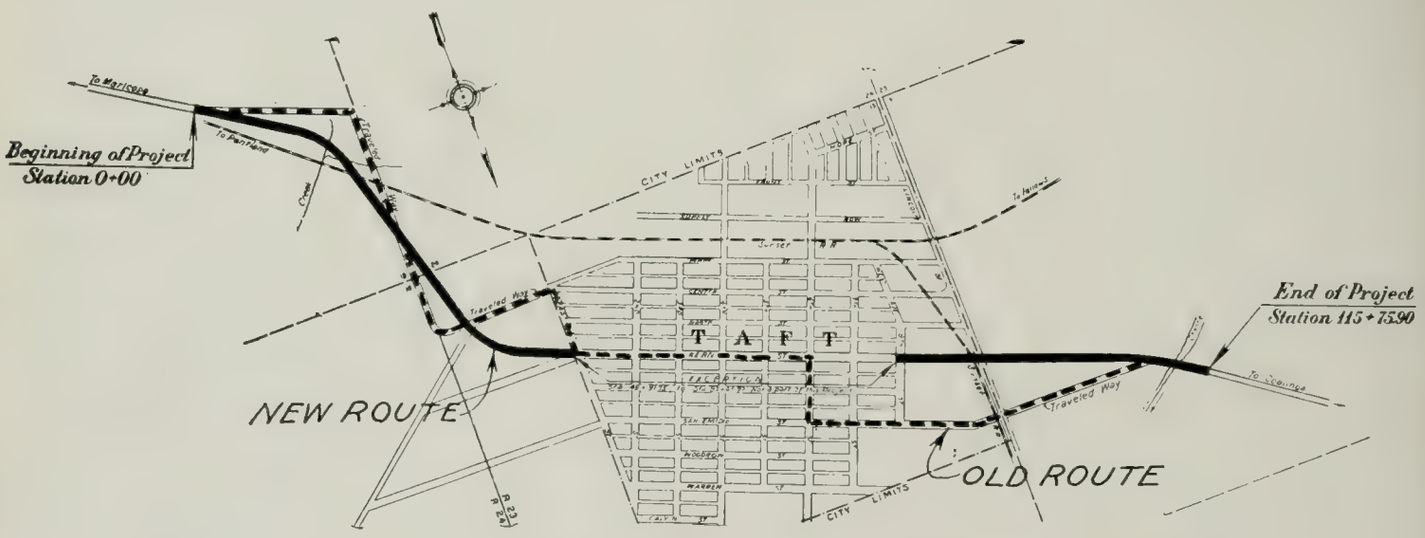
Each year the Institute invites a jury composed of architects and engineers of national prominence to select the most beautiful bridges in each of three cost classes.

Relocation of Highway Through Taft Celebrated With Dedication Ceremony

IN THE PRESENCE of a large number of citizens, city, county and State officials and representatives of the local chamber of commerce, Chairman Harry A. Hopkins of the California Highway Commission, on May 28, officially opened the recently completed relocation of State Highway Route No. 138 through the city of Taft in Kern County.

This State highway, extending from Ventura on the south to Coalinga on the north, a distance of 220 miles, formerly entered the city by a circuitous route marked by a number of right angle turns, several of which were within the city limits.

The new route enters Taft on long, easy curves and runs through the city on Kern Street, a 100-foot boulevard which had been previously paved by the city for its full width.



SKETCH MAP showing relocated highway routing compared with old traveled way.

COST SHARED BY CITY

While only 0.16 of a mile of the project was within the city limits, the whole improvement covered a distance of 1.6 miles and relocated the highway from one mile east of Taft to one-half mile west of the city.

The cost of the improvement was $41,000 of which the city paid $4,000 from its allotment of the gas tax funds and the State paid $11,000 for construction and right of way inside the city limits.

In addition to construction and right of way costs it was necessary to remove and reconstruct a portion of an oil company plant and relay pipe lines of several other oil and gas companies.

LUNCHEON PRECEDED CEREMONIES

The improvement involved the construction of two bridges and grading and surfacing roadway with a 20-foot width of bituminous treated rock, with 8-foot shoulders.

The dedication ceremonies were preceded by a luncheon given by the Taft Chamber of Commerce at which former Mayor Clarence A. Williams acted as toastmaster and introduced Councilman Davis, acting mayor in the absence of Mayor Emmons, District Engineer R. M. Gillis of the Division of Highways, Chairman Harry A. Hopkins of the Highway Commission and other guests.

During the ceremonies the Taft Union High School Band played several patriotic and inspiring numbers.

"What caused the explosion at your house, Jones?"
"Well, I'll tell you, old boy, it was a little bit of powder on my coat sleeve."

The preacher was out on the links and thought a small moral lesson might not be amiss.

"I notice," he remarked mildly, "that the players who get the lowest scores are not those who swear."

"What the h—l have they got to swear about?" snorted the gloomy golfer as he dug up another slice of turf.

NEW HIGHWAY LINK on a portion of the State Route 138 between Coalinga and Ventura. The photograph shows the east end of the Taft relocation project where it crosses the old highway.

SCISSORING THE RIBBON, assisted by Miss California and Miss Taft, Chairman Harry A. Hopkins of the California Highway Commission officially opens the relocated link of the Ventura-Coalinga highway through the city of Taft. The man at Mr. Hopkins' elbow holding the hat is Acting Mayor T. E. Davis.

CAMPAIGN STARTED TO ESTABLISH U. S. DEPARTMENT OF PUBLIC WORKS

Establishment of a Department of Public Works in the Federal government and the addition of a Secretary of Public Works to the President's cabinet, is to be the object of a campaign by the National Society of Professional Engineers, according to an announcement made by D. B. Steinman, president of the society at the annual meeting of the New Jersey Association of Professional Engineers held in Newark on March 16. A like proposal was put before the New York State Society of Professional Engineers at its winter meeting held in Albany on March 2. At that time a resolution was adopted calling upon the national society to promote the appointment of a professional engineer to the position of Secretary of Public Works.

Plantings Beautify Coast Road Slopes

(Continued from page 4)

wide in the outlying sections and 76 feet wide through the built-up areas. Outside of the heavier built-up areas where the pavement is 40 feet wide, oil shoulders 20 feet wide were laid to be used both for parking and to relieve congestion in traffic.

In the city of Santa Monica there are certain isolated sections where the roadway width was reduced because the acquisition of the necessary right of way was economically unsound, as it would entail the moving and reconstruction of large buildings.

FIRST PAVED IN 1923

The first construction by the State on this highway was in 1923, when a 20-foot strip of pavement was placed. In April, 1932, work was started to widen the pavement and roadbed, beginning at Beverly Boulevard in Santa Ynez Canyon and ending at West Channel Road in Santa Monica Canyon, some $2\frac{1}{2}$ miles. On the ocean side, particularly on State Park lands, the fill was widened an extra 20 feet to provide parking area, and the fill slope temporarily protected with riprap until the beach could be built up.

For the purpose of building up and protecting the beach, five groynes were constructed under a separate contract concurrently with the road work, and it was expected that the beach would be built up sufficiently by these groynes to protect the fill.

MAJOR SLIDE OCCURRED

Even before this part of the road was completed, slides started on the palisades side. A major slide, known as the McCormick slide, occurred in front of the estate of that name, bringing down some 93,000 cubic yards of material, which blocked the highway and closed the road to traffic entirely for ten days.

The occurrence of this slide showed the necessity for the placing of slope protection work and other work of more or less pioneering nature to prevent loss by slides.

Some of the slope protection work was done under separate contracts and some as a part of the highway work. In one case it was found necessary, in order to avoid further slides, to remove the material of the slopes which seemed to be out of equilibrium with the material already down, and to terrace the slopes, constructing an oiled ditch and installing suitable drainage facilities to take care of the collected water.

GROYNES BUILD BEACH

The groynes mentioned above, constructed of interlocking steel sheet piling, were placed approximately 400 feet apart and extended 200 feet out into the ocean from the fill, with the top of groyne elevation +9 feet at the road end and +1 foot at the ocean end. These groynes were constructed with a two-fold purpose; first, to build up the beach for protection of the fills that were exposed to heavy sea action; secondly, to materially increase the useful beach area for the public.

On the cliffs just westerly of Beverly Boulevard the original subdividers had constructed a 10-foot walk with a parapet wall above the highway. In order to get the necessary 80-foot width of roadway to handle the large volume of traffic, it was necessary to narrow the walk and reconstruct the parapet wall, steepening the earth slopes below the wall and supporting them with a substantial system of concrete slope reinforcement.

BEAUTIFUL LANDSCAPE EFFECT

The slope was then planted with mesembryanthemum, with one row of Monterey Cypress placed just in back of the curb. This whole installation, approximately 400 feet long, produced a beautiful landscape effect, which falls in line with the State and Federal Government's program for the beautification of highways.

Further landscaping work is being done inside the city of Santa Monica on the land side, materials and supervision being furnished by the State and all labor from the SERA in the city of Santa Monica.

The greatest amount of excavation was done on the next section of the highway, from Las Flores Canyon to the west city limits of Los Angeles, amounting to 1,060,000 cubic yards. Of this, 560,000 cubic yards were excess excavation which it was necessary to haul a considerable distance for disposal, as it could not be spread over valuable beaches adjacent to the roadway cuts. About sixty per cent of this material was distributed in the lower Topanga Creek basin, and some of the rocky excavated material was used for constructing small groynes.

Beach Houses Removed to Build Fill

(Continued from preceding page)

In making this fill at the lower Topanga Creek basin, it was found necessary to remove 129 small beach houses, and they were then moved either to a new location or returned to their former location after completion of the fill.

CONCRETE SLOPE PROTECTION

Construction is practically completed on the portion of the road between the west city limits of Los Angeles and Beverly Boulevard. The owners of the property on the cliff side along this portion of the road had constructed expensive retaining walls supporting walks and roadways, and as the highway was widened on the land side, this necessitated the placing of considerable reinforced concrete slope protection to give the owners equal facilities after the road was constructed.

Four more steel sheet piling groynes were constructed along the fill near Castle Rock at the points where the fills extended out on the beach, and it is expected that these will furnish, eventually, additional beach for recreational purposes, as well as protection for the highway embankment slopes.

One of the main traffic feeders from Los Angeles into the beach area is West Channel Road. In 1934 it became necessary to relieve traffic congestion at this important intersection. During the latter part of February, 1934, work on that portion of the Coast Highway between West Channel Road and the California Incline in the City of Santa Monica was started. As a replacement of the old 20-foot pavement without shoulders, a pavement 76 feet wide between curbs with a sidewalk on each side thereof was authorized and constructed.

UNDERPASSES FOR PEDESTRIANS

Because of expensive improvements on the beach side of the highway, the widened right of way in connection with this contract was all on the land side. Two pedestrian underpasses were constructed, one at West Channel Road and the other about 700 feet southerly. These underpasses carry pedestrian traffic under the highway to the public beach.

Adjacent to this contract and running from the California Incline to the west portal of the proposed Colorado Street tunnel, a contract is now under way, the pavement to have a minimum width of 76 feet. This contract will complete that portion of the highway which is constructed next to the beach proper, and starts the swing of the highway at its lower end through the tunnel and over Pennsylvania Avenue to Lincoln Boulevard.

The old wooden overhead structure which carried pedestrian traffic over the highway is being removed, and a new steel and concrete bridge constructed in its place.

TUNNEL 400 FEET LONG

At the southerly end of the above work, a tunnel 400 feet in length, having a reinforced concrete arch with a clear span of 56 feet, is at present being constructed to carry the Coast Highway under Ocean Avenue and Colorado Avenue in Santa Monica. Through the tunnel a roadway of 48 feet will be provided, with sidewalks 3 feet eight inches in width on each side.

An open cut is to be made through the City Park and across Ocean Avenue and Colorado Avenue, and after the tunnel section is concreted, backfill will be made and the street over the tunnel regraded and restored.

Beginning at the southeasterly portal of the tunnel is the final link of the project, which will connect with Lincoln Boulevard in Santa Monica. On this portion bids were recently opened, and award of the contract has just been made. As projected, this location follows along the old Southern Pacific Railroad right of way, which was purchased from this company, passing under the existing bridge at Main Street and extending to Fifth Street, and thence along Pennsylvania Avenue to Lincoln Boulevard.

TRAFFIC NOT INTERRUPTED

The existing road surface of the highway on the western section of the project from Las Flores Canyon to Santa Monica was still in excellent condition so that the pavement was either widened or used as a base for new pavement. The location of this route at the base of the cliffs precluded the possibility of detours while construction was under way. This necessitated the handling of a heavy volume of traffic through the work at all times which was accomplished without any serious congestion or any major accident that could be attributed solely to construction of the new road.

Wire Mesh Catwalks, Spool Brakes and Electric Spinning Control on Bay Bridge

THE FOOTBRIDGES completed for one mile over the San Francisco-Oakland Bay Bridge between Rincon Hill and the center anchorage, are the latest development in catwalks—fireproof and fallproof; and the spinning wheels thereon will have new safety controls never before used in suspension bridge building, it was revealed with the arrival of Curtis S. Garner and H. C. Hunter, Pennsylvania experts in suspension bridge construction, who will join forces with the contractors on the $22,000,000 superstructure of the bridge.

"Catwalks in the past have been made of lumber and easily caught fire," Garner explained. "The solid lumber catwalks were sails in the wind and their movement endangered workmen. By installing the wire mesh flooring catwalks, we have at once removed the fire hazard and the wind hazard. The steel mesh is, of course, impervious to fire, and lets the wind blow through without much swaying."

TWO SAFETY FEATURES

On his arrival from Pittsburgh, Garner went into conference with State Director of Public Works Earl Lee Kelly; Chief Engineer C. H. Purcell; Edward J. Schneider, contracting manager of the Columbia Steel Company; W. J. Ward, superintendent of erection; and E. E. McKeen, steel company resident engineer.

Two features will make spinning the cables of the San Francisco-Oakland Bay Bridge safer than any similar work undertaken previously. Those features are: (1) steel wire catwalks, which are fire and wind proof; (2) automatic, mechanical, and manual electrical control of the cable spinning operations.

One of the dangers of cable spinning in the past has been the jerking and jumping of the spinning wheel movement. The steel company and affiliated engineers believe they have eliminated this danger by means of a tower with a system of counter-balancing pulley wheels, working in cooperation with the reels of wire so that all slack is constantly kept out of the spinning wire.

BRAKES ON SPOOLS

By mechanical devices it is provided that any slack is immediately taken up by brakes applied to the huge spools of cable wire. In addition to this mechanical control of slack, an electrical system of switches is provided at 250-foot intervals over the entire catwalk so that in case of accident or a snarled wire all movement can be immediately shut down by the workmen witnessing the accident.

In the past, spinning wheels becoming snarled in the wire continued jumping and plunging until the reel workers at the ends of the bridge could be notified by telephone or signal cords to shut down operations. Peril to workmen resulted because of these unchecked snarls.

The spinning wheel arms will carry two wheels so that four wires can be laid in the cable simultaneously. The wheels will travel approximately seven miles an hour over the one-mile course.

DOUBLE SPINNING WHEELS

The features of the bay bridge cable spinning which are new to suspension bridge engineering are: (1) automatic brakes on the spools connecting to counter-balancing towers to take up wire slack; (2) wire mesh (or chain link) fireproof, windproof catwalks; (3) electrical control of operations from switches at either end, and at intervals of 250 feet over the catwalk; (4) a perfected form of two-sheave spinning wheel.

Arrangements are being made by State Director of Public Works Earl Lee Kelly for inspection of the bridge catwalks by Governor Frank F. Merriam.

"Ish no use," sighed the drunk, as he staggered into the telephone pole for the third time. "I'm losht in an impen'trable fores'."

The Lady: "Hobo, did you notice that pile of wood in the yard?"

"Yes'm, I seen it."

"You should mind your grammar. You mean you saw it."

"No'm. You saw me see it, but you ain't seen me saw it."

A BOUNCING AERIAL WIRE TRAIL, ten feet wide, swinging high across the waters of San Francisco Bay, and no place for a promenade on a windy day, is a catwalk of the San Francisco-Oakland Bay Bridge. Built of steel mesh suggesting husky chicken wire, with mesh about a half inch square, and supported on timber cross-beams bolted to 2¼-inch cables at intervals of 10 feet, it affords a springy footing for the iron-nerved helmeted workers. Cable hand-rails will later be provided supported by posts seen hanging like a fringe from the right catwalk. The inset affords an idea of the dizzy height of the walks in comparison with the ferryboat below.

APPORTIONMENT OF ONE-FOURTH CENT GAS TAX TO CITIES FOR BIENNIUM ENDING JUNE, 1935—Continued

(Continued from page 9)

District	City or town	Symbol	County	Abbreviation	Population	Total allocation
XI	Calipatria	Clp	Imperial	Imp	1,554	1,927 74
IV	Calistoga	Cstg	Napa	Nap	1,000	1,240 50
V	Carmel-by-the-Sea	Cml	Monterey	Mon	2,260	2,803 54
X	Ceres	Cer	Stanislaus	Sta	981	1,216 93
III	Chico	Chc	Butte	But	7,961	9,875 65
VIII	Chino	Chn	San Bernardino	S.Bd.	3,118	3,867 89
VI	Chowchilla	Chw	Madera	Mad	847	1,050 70
XI	Chula Vista	Ch.V.	San Diego	S.D.	3,869	4,799 51
VII	Claremont	Cla	Los Angeles	L.A.	2,719	3,372 93
IV	Cloverdale	Clvd	Sonoma	Son	759	941 54
VI	Clovis	Clo	Fresno	Fre	1,316	1,632 50
VI	Coalinga	Clng	Fresno	Fre	2,851	3,536 68
III	Colfax	Cfx	Placer	Pla	912	1,131 34
VIII	Colton	Col	San Bernardino	S.Bd.	8,014	9,941 39
III	Colusa	Clu	Colusa	Col	2,116	2,624 90
VII	Compton	Com	Los Angeles	L.A.	12,516	15,526 14
IV	Concord	Cnd	Contra Costa	C.C.	1,125	1,395 57
VI	Corcoran	Crcn	Kings	Kin	1,768	2,193 21
II	Corning	Cng	Tehama	Teh	1,377	1,708 17
VIII	Corona	Cor	Riverside	Riv	7,018	8,705 85
XI	Coronado	Cord	San Diego	S.D.	5,425	6,729 73
IV	Corte Madera	C.Mad	Marin	Mrn	1,027	1,274 00
VII	Covina	Cov	Los Angeles	L.A.	2,774	3,441 16
I	Crescent City	Cr.C.	Del Norte	D.N.	1,720	2,133 67
VII	Culver City	Cl.C.	Los Angeles	L.A.	5,669	7,032 41
IV	Daly City	Dl.C.	San Mateo	S.M.	7,838	$9,723 06
III	Davis	Dvs	Yolo	Yol	1,243	1,541 94
VI	Delano	Dln	Kern	Ker	2,632	3,265 01
VI	Dinuba	Dba	Tulare	Tul	2,968	3,681 81
V	Dixon	Dxn	Solano	Sol	1,000	1,240 50
II	Dorris	Drs	Siskiyou	Sis	762	945 26
II	Dunsmuir	Dmr	Siskiyou	Sis	2,610	3,237 71
XI	El Cajon	E.Cj.	San Diego	S.D.	1,050	1,302 53
XI	El Centro	E.Cn.	Imperial	Imp	8,434	10,462 40
IV	El Cerrito	E.Cr.	Contra Costa	C.C.	3,870	4,800 75
VII	El Monte	E.Mte.	Los Angeles	L.A.	3,479	4,315 71
VII	El Segundo	E.Seg.	Los Angeles	L.A.	3,503	4,345 48
VIII	Elsinore	Esn	Riverside	Riv	1,350	1,674 68
IV	Emeryville	Emv	Alameda	Ala	2,336	2,897 82
XI	Escondido	Esd	San Diego	S.D.	3,421	4,243 76
II	Etna	Etn	Siskiyou	Sis	379	470 15
I	Eureka	Eur	Humboldt	Hum	15,752	19,540 41
VI	Exeter	Exr	Tulare	Tul	2,685	3,330 75
IV	Fairfax	Frfx	Marin	Mrn		
X	Fairfield	Frfd	Solano	Sol	1,131	1,403 01
I	Ferndale	Fer	Humboldt	Hum	889	1,102 81
VII	Fillmore	Fil	Ventura	Ven	2,893	3,588 78
VI	Firebaugh	Fir	Fresno	Fre	506	627 70
I	Fort Bragg	F.Bg.	Mendocino	Men	3,022	3,748 80
II	Fort Jones	F.Jn.	Siskiyou	Sis.	302	374 63
I	Fortuna	Fta	Humboldt	Hum	1,239	1,536 98
VI	Fowler	Fow	Fresno	Fre	1,171	1,452 63
VI	Fresno	Fre	Fresno	Fre	52,513	65,142 54
VII	Fullerton	Ful	Orange	Ora	10,860	13,471 86
VII	Gardena	Gar	Los Angeles	L.A.		
IV	Gilroy	Gil	Santa Clara	S.Cl.	3,502	4,344 24
VII	Glendale	Gndl	Los Angeles	L.A.	62,736	77,824 21
VII	Glendora	Gdr	Los Angeles	L.A.	2,761	3,425 03
III	Grass Valley	G.Vy.	Nevada	Nev	3,817	4,735 00
III	Gridley	Grd	Butte	But	1,941	2,407 82
X	Gustine	Gus	Merced	Mer	1,016	1,260 35
VI	Hanford	Han	Kings	Kin	7,028	8,718 25
VII	Hawthorne	Haw	Los Angeles	L.A.	6,596	8,182 36
IV	Hayward	Hay	Alameda	Ala	5,530	6,859 98
IV	Healdsburg	Hlbg	Sonoma	Son	2,296	2,848 20

APPORTIONMENT OF ONE-FOURTH CENT GAS TAX TO CITIES FOR BIENNIUM ENDING JUNE, 1935—Continued

District	City or town	Symbol	County	Abbreviation	Population	Total allocation
VIII	Hemet	Hem	Riverside	Riv	2,235	2,772 52
IV	Hercules	Her	Contra Costa	C.C.	392	486 28
VII	Hermosa Beach	Hm.B.	Los Angeles	L.A.	4,796	5,949 45
IV	Hillsborough	Hil	San Mateo	S.M.	1,891	2,345 79
V	Hollister	Hst	San Benito	S.Bt.	3,757	4,660 57
XI	Holtville	Holt	Imperial	Imp	1,758	2,180 81
X	Hornitos	Hor	Mariposa	Mpa	62	76 91
VII	Huntington Beach	Hnt.B.	Orange	Ora	3,690	4,577 46
VII	Huntington Park	Hnt.P.	Los Angeles	L.A.	24,591	30,505 21
XI	Imperial	Imp	Imperial	Imp	1,943	2,410 30
XI	Indio	Ind	Riverside	Riv		
VII	Inglewood	Ing	Los Angeles	L.A.	19,480	24,165 00
X	Isleton	Ist	Sacramento	Sac	2,090	2,592 65
X	Jackson	Jkn	Amador	Ama	2,005	2,487 21
V	King City	Kn.C.	Monterey	Mon	1,483	1,839 66
VI	Kingsburg	Kngb	Fresno	Fre	1,322	1,639 95
VII	Laguna Beach	Lgn.B.	Orange	Ora	1,981	2,457 44
VII	La Habra	L.Hbra.	Orange	Ora	2,273	2,819 66
I	Lakeport	Lkpt	Lake	Lak	1,318	1,634 98
XI	La Mesa	L.Msa.	San Diego	S.D.	2,513	3,117 38
IV	Larkspur	Lksp	Marin	Mrn	1,241	1,539 46
VII	La Verne	L.Vn.	Los Angeles	L.A.	2,860	3,547 84
IV	Lawndale	Lndl	San Mateo	S.M.	369	457 75
VI	Lemoore	Lem	Kings	Kin	1,399	1,735 47
III	Lincoln	Lncn	Placer	Pla	2,094	2,597 61
VI	Lindsay	Lnsy	Tulare	Tul	3,878	$4,810 67
IV	Livermore	Lvmr	Alameda	Ala	3,119	3,869 13
X	Livingston	Lvtn	Merced	Mer	803	996 12
X	Lodi	Lod	San Joaquin	S.J.	6,788	8,420 54
V	Lompoc	Lom	Santa Barbara	S.B.	2,845	3,529 23
VII	Long Beach	L.Bch.	Los Angeles	L.A.	142,032	176,191 14
VII	Los Angeles	L.A.	Los Angeles	L.A.	1,240,359	1,538,669 26
X	Los Banos	L.Bns.	Merced	Mer	1,875	2,325 94
IV	Los Gatos	L.Gts.	Santa Clara	S.Cl.	3,168	3,929 91
III	Loyalton	Loy	Sierra	Sie	837	1,038 30
VII	Lynwood	Lyn	Los Angeles	L.A.	7,323	9,084 20
VI	Madera	Mad	Madera	Mad	4,665	5,786 95
VII	Manhattan Beach	Man.B.	Los Angeles	L.A.	1,891	2,345 79
X	Manteca	Mtca	San Joaquin	S.J.	1,614	2,002 17
VI	Maricopa	Mcp	Kern	Ker	1,071	1,328 58
IV	Martinez	Mtz	Contra Costa	C.C.	6,569	8,148 87
III	Marysville	Mvl	Yuba	Yub	5,763	7,149 02
VII	Maywood	Myd	Los Angeles	L.A.	6,794	8,427 98
IV	Menlo Park	MlP.	San Mateo	S.M.	2,254	2,796 09
X	Merced	Mer	Merced	Mer	7,066	8,765 40
IV	Mill Valley	Ml.V.	Marin	Mrn	4,164	5,165 46
X	Modesto	Mod	Stanislaus	Sta	13,842	17,171 05
VII	Monrovia	Mnro	Los Angeles	L.A.	10,890	13,509 08
II	Montague	Mntg	Siskiyou	Sis	507	628 94
VII	Montebello	Mtbl	Los Angeles	L.A.	5,498	6,820 29
V	Monterey	Mon	Monterey	Mon	9,141	11,339 44
VII	Monterey Park	Mon.P.	Los Angeles	L.A.	6,406	7,946 66
IV	Morgan Hill	Mg.H.	Santa Clara	S.Cl.	908	1,126 38
IV	Mountain View	M.Vw.	Santa Clara	S.Cl.	3,308	4,103 58
II	Mount Shasta	M.Sha.	Siskiyou	Sis	1,009	1,251 67
IV	Napa	Nap	Napa	Nap	6,437	7,985 12
XI	National City	Nat.C.	San Diego	S.D.	7,301	9,056 91
VIII	Needles	Ned	San Bernardino	S.Bd.	3,144	3,900 14
III	Nevada City	Nev.C.	Nevada	Nev	1,701	2,110 10
X	Newman	Newm	Stanislaus	Sta	1,269	1,574 20
VII	Newport Beach	Npt.B.	Orange	Ora	2,203	2,732 83
III	North Sacramento	N.Sac.	Sacramento	Sac	2,097	2,601 34
X	Oakdale	Okdl	Stanislaus	Sta	2,112	2,619 94
IV	Oakland	Oak	Alameda	Ala	284,063	352,381 05
XI	Oceanside	Ocn	San Diego	S.D.	3,508	4,351 69

(Continued on page 33)

Sodium Vapor Lights Chosen to Illuminate Bay Bridge Roadways

SODIUM VAPOR lighting has been selected by Chief Engineer C. H. Purcell to illuminate the San Francisco-Oakland Bay Bridge, and bids for electrification of the bridge will be received by State Director of Public Works Earl Lee Kelly June 26.

Approximately 1000 light standards, 26 feet above the roadway, will be located 150 feet apart on both decks of the bridge.

The sodium light consists of a tube, approximately 3 inches in diameter and from 10 to 12 inches in length, containing two electrodes, one in either end. The tube is filled with sodium gas, that gives off a golden yellow light, which, because it is monochromatic as contrasted with polychromatic incandescent lights, gives the eye a sharp picture of all that is illuminated, causing objects to stand out as if in relief.

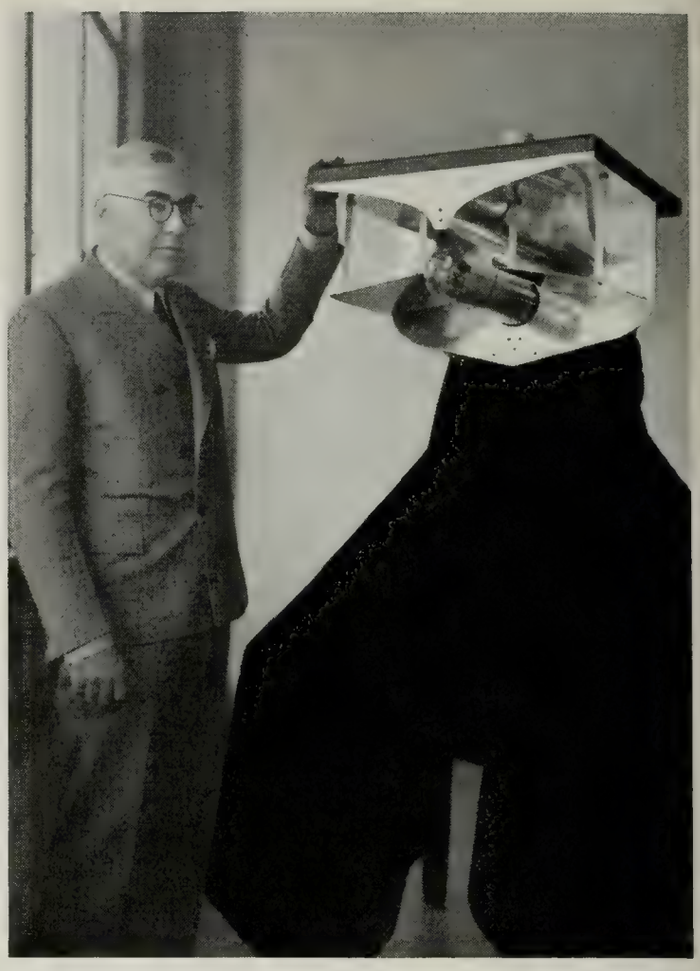
LONG USED IN EUROPE

The advantages claimed for this form of outdoor lighting, used successfully in Europe for approximately eight years and in the United States since early in 1933, are improved clarity, due to its monochromatic character, resulting in maximum safety to motorists; cheapness of operation, in that it supplies 10,000 lumens on 220 watts of electricity compared to 500 watts for the same number of luments in an incandescent light; and lastly, lack of glare, because the source of the light is not concentrated in a small space as in the incandescent bulb.

So free of glare is the sodium light that the eye can look directly at a powerful globe from a few feet without being blinded. The monochromatic feature of the sodium light gives the eye somewhat the same picture as that which is presented by the infra-red photograph.

Before selecting the lights, Chief Engineer Purcell appointed a committee to study and pass upon them.

The lights were recommended unanimously by the committee, consisting of: H. J. Brunnier, California State Automobile Association; Superintendent Carl E. Hardy, of electrical department, City of Oakland; Designing Engineer W. H. Ohmen, City of San Francisco; Chief Electrical Engineer Paul J. Ost, City of San Francisco; Street Lighting Engineer A. O. Olson, City of San Francisco.



GLARELESS SODIUM VAPOR light and beside it Chief Engineer C. H. Purcell who selected it for use on the San Francisco-Oakand Bay bridge for reasons of efficiency, safety and economy.

Alma Mater Confers Honors on C. H. Purcell

The University of Nebraska at Lincoln conferred on June 10th the honorary degree of Doctor of Engineering upon Charles H. Purcell, State Highway Engineer of California and Chief Engineer of the San Francisco-Oakland Bay Bridge.

This signal honor comes to Mr. Purcell from his alma mater in recognition of his distinguished accomplishments as a bridge and highway engineer.

The degree conferred upon him is the highest honor given by universities to men who are outstandingly preeminent in the engineering profession.

Mr. Purcell's years of experience in engineering have covered varied phases of railroad, bridge and highway work, not only in the United States, but in foreign fields as well, and on this occasion the Department of Highways extend to Mr. Purcell heartiest congratulations on this timely recognition of his distinguished attainments.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 JUNE, 1935 No. 6

Highway Landscaping

The first comprehensive State highway landscaping project has been started on the new six-mile Ramona Boulevard major artery from Los Angeles civic center into Garvey Avenue.

Approximately 8000 trees and shrubs and 25,000 ground cover plants will be placed along this route.

The job represents the first State landscaping contract on record, for which $30,000 of Federal aid money has been allotted. This includes cost of laying the pipe lines to water plants, which were put in before the final paving job was completed a few weeks ago.

This beautifying work on a definite plan along the new route promises to make the highway especially attractive, declare auto club engineers who recently lauded the State department for construction of the new through route in record time. Ramona extension is now a direct line from Mission and Aliso Streets, Los Angeles, insuring rapid and safer transit east through elimination of all main intersections and grade crossings by bridge separations.

Landscaping will be in naturalistic style from Monterey Park west some two miles to the first overhead crossing. Absence of sidewalks there and the rolling terrain resulted in the plan to plant sugar gum eucalyptus trees in groups on this section, and as many native plants and flowers as possible on all cut and fill slopes.—*Automobile Club of Southern California.*

Kissing her gently: "Haven't I met you before somewhere?"

Kissing her gent: "No, it's just the situation that's so familiar."

473 Contracts Put Under Way Since This Biennium Began

(Continued from page 11)

State by improvement to the State Highway System, but also that through the effort expended in preparation, advertising, awarding and supervision of the 473 contracts which have been put under way since the beginning of the biennium, thousands of Californians have found employment and have been aided in weathering the vicissitudes of the depression.

To those outside an organization such as the Division of Highways it is difficult to realize the vast amount of work necessary to put under way a construction program of the magnitude of the one now nearing completion. Each project, whether large or small, requires careful planning; comprehensive surveys in the field; expert design of the proposed work; accurate estimates of materials and work involved; preparation of drawings, plans and specifications; laboratory tests of materials and settlement of right of way negotiations.

The Division of Highways feels gratification for the loyal support the members of the organization have given in accomplishing the program, thereby making work available to thousands of Californians throughout the State.

CHEER FOR MAINTENANCE CREWS

One of the most important duties of the division, and one which rarely receives public recognition, involves the maintenance of the State's highways. Efficiently, and without blare of trumpets, maintenance crews labor to protect and conserve the public's investment, waging continual warfare against the destroying attacks of time and the elements to keep the State roads in usable condition.

One has only to observe the rapid deterioration of a discontinued stretch of road to realize the great value of the work performed by the maintenance branch of the State highway organization. Road surfaces irrespective of type, shoulders, side ditches, and drainage structures require constant attention, and while the Division of Highways feels pride in the construction accomplishments of its engineers, there is equal satisfaction in the loyal work of the members of the maintenance organization.

Relocations Plan 6 Bridges, 12 Tunnels

(Continued from page 17)

vey would have saved little, if any, distance over the present highway length.

OREGON TRAIL COUNTRY

The line as tentatively adopted turns to the right at the north end of the proposed Pit River bridge, climbs to a summit elevation of 1670 feet, then descends to elevation 1280 just north of O'Brien summit, where it crosses to the east of the present highway. From this point ahead, the line roughly traverses the country through which the original Oregon Trail was built.

While maximum grade had to be used on the descents into Salt Creek and the Sacramento River, a very direct line was obtained with good alignment, including one tangent of 6700 feet. Salt Creek is crossed in fill. The Sacramento River crossing, about 2000 feet below Antler station on the railway, calls for a 1400-foot structure with grade about 190 feet above river bed.

From the north end of this proposed bridge to a connection with the present highway, a long fill is required, averaging 15 feet in height. Just ahead of this point of connection, the railroad relocation crosses the highway on a 22-foot fill. So an underpass solves the final problem of the last crossing.

CROSSES RAILROAD TUNNELS

Between the proposed Pit River bridge and the underpass just mentioned, the highway line crosses the railroad relocation twice, both times over their proposed tunnels. Apart from these crossings and interference at the joint bridge approaches, there is no conflict between lines whatever.

Railway relocation would start in Redding approximately at the new overhead crossing now being constructed. The present tentative railroad proposal calls for four crossings of the Sacramento River: one at Redding, a 1600-foot structure all on curve, placed between the old and new highway bridges; one below Antler and two below Delta; also a long structure across O'Brien, Salt and Doney creeks, totaling in all some 8200 lineal feet.

Twelve tunnels are also required totaling approximately 19,000 lineal feet, the longest tunnel being 2800 feet in length. Grades used were +0.9 per cent compensated north bound with a —0.5 per cent adverse grade. This is practically the same as is now in use on the line to be rebuilt, but the proposed revision has more adverse grade and greater rise and fall. The total length of revision from Redding to Delta is approximately 30 miles.

Railroad surveys were made under direction of J. A. Given, Division Engineer of the Southern Pacific Company, with Russell Chase in charge as Locating Engineer.

Both highway and railroad relocation plans are in a preliminary stage, subject to change. Figures and statements made above and summarized in the following tabulation are given with this reservation:

	Highway		Railroad	
	Old	New	Old	New
Length of Line Miles	16	12.8	37.2	29.6
Maximum Grade Used Per Cent	6.5	6.0 Comp.	1.0 Comp.	0.9 Comp.
Highest Summit Used Elev.	1351	1670.0	1123	1215
Rise and Fall Feet	2590.0	2218.0	637	854
Bridges Required Lin. Ft.	2027	1620.0	2300.0	8200
Bridge Across Pit River-Joint Use Lin. Ft.		3500		3500
Tunnels Required Lin. Ft.			3754	19000

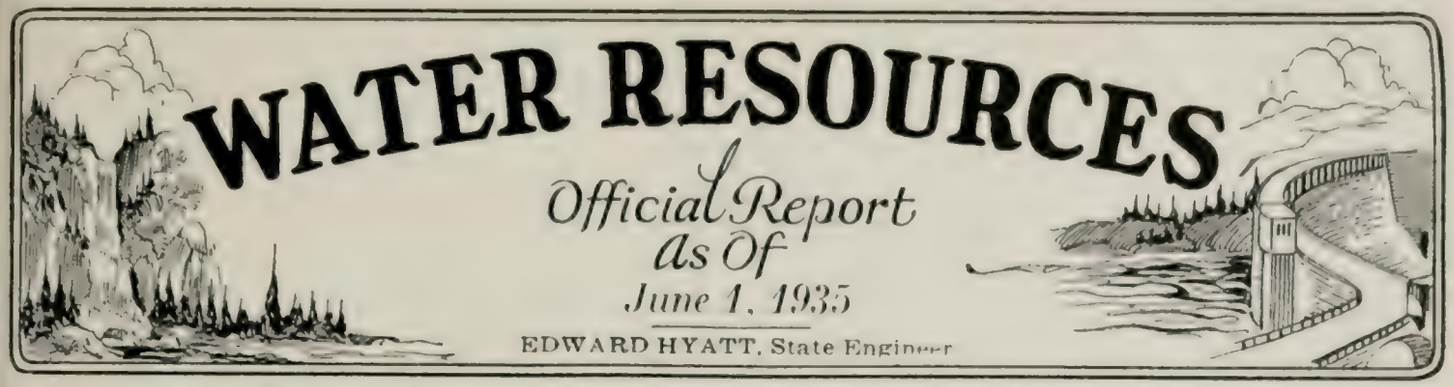
MONTEREY PARK CELEBRATES COMPLETION OF HIGHWAY LINK

(Continued from page 12)

Road in Los Angeles one can travel to Atlantic Boulevard in Monterey Park, a distance of six miles, without encountering a "Stop" sign to impede his progress.

Although this route is now open all the distance from Aliso Street and Mission Road in Los Angeles to Pomona, there is still one major construction contract remaining to be done. This is for widening of Garvey Avenue from New Avenue in Monterey Park to Mountain View Avenue at El Monte, to bring it up to the same high standard as the rest of the route. The contract has just been awarded for this section, which is 4.7 miles in length.

The finishing touch is being added to the Ramona Boulevard portion of the route, from Monterey Park to Los Angeles, by landscaping the edges of the highway with groups of trees and shrubs, and by planting ice plant on the high cut slopes, both to beautify the highway and to prevent excessive erosion.



Loans have been granted by the Federal Reconstruction Finance Corporation for refinancing the indebtedness of thirteen irrigation districts. The total amount of funds available for immediate disbursement under these completed loans is approximately $6,525,000, which amount is being used in the purchase and refunding of approximately $13,242,000 of irrigation district bonds.

An order approving for certification by the State Controller refunding bonds of the Vista Irrigation District in the principal amount of $937,500, was issued by the Districts Securities Commission.

News of dam applications and construction, stream flow, water distribution and other activities of the Division of Water Resources are contained in the regular monthly report as follows:

SERA RELIEF WORK

Work was continued with SERA relief labor up to May 18th but, as the number of men available for each job was decreasing so rapidly, all the projects have now been discontinued. The majority of men on the relief rolls are now finding work in private employment, particularly in agricultural pursuits. At this date it is not possible to secure sufficient relief labor on any of our projects to warrant the expenditure of the necessary overhead.

A total of 15,917 man-hours of relief labor was worked during this period, making a total to date of 244,384 man-hours. The labor utilized upon various relief projects to this date is as follows:

	Man-hours
Federal Transient Service, upper Sutter By-pass	8,333
SERA Project No. 58-B14-15, Feather River north of Marysville	63,737
SERA Project No. 58-B13-35, Feather River south of Marysville	44,356
SERA Project No. 35-B14-222, American River, leveling spoil bank	6,905
SERA Project No. 51-B13-10, Bear River	15,175
Federal Transient Service, seepage canal	850
SERA Project No. 51-B14-39, Butte Slough By-pass	7,783
SERA Project No. 35-B14-27, American River clearing	61,918
Federal Transient Service, lower Sutter By-pass	15,490
Federal Transient Service, Tisdale By-pass	2,989
SERA Project No. 35-B14-40, Mokelumne River	7,376
SERA Project No. 57-B14-4, Sacramento By-pass	9,472
Total	244,384

Work has been started with a crew of 30 men, clearing timber and brush from the right bank of the Mokelumne River near New Hope Landing.

DAMS

Application for the construction of the West Valley dam was filed on April 24, 1935. The dam will be an earthfill structure located on West Valley Creek approximately two miles above its junction with the South Fork of the Pit River in Modoc County. The dam is to be approximately 47 feet in height with a storage capacity of 16,700 acre feet of water for the use on lands of the South Fork Irrigation District. After a complete review of the plans and inspection of the site the application was approved on May 4, 1935. The estimated cost of the dam is $73,000.

Application for the construction of the Grant Lake dam was filed by the City of Los Angeles, Bureau of Water Works and Supply on April 26, 1935. The dam will be located on Rush Creek in Mono County, is to be 72 feet in height and will store approximately 49,300 acre feet of water for domestic and power purposes. The estimated cost of the structure is $347,600.

RECONSTRUCTING SPILLWAY

Application for the repair of the Kelly and Greiner dam in Modoc County was filed on April 20, 1935. The work proposed consists of reconstruction of the spillway increasing the freeboard and the section of the dam. This application was approved on May 2, 1935.

Application for the repair of the Paicines reservoir in San Benito County was filed on May 4, 1935. The work proposed consists of increasing the freeboard on the structure, protection of the embankment against wave wash and elimination of seepage conditions. This application was approved on May 15, 1935.

Application for the enlargement of the Flora Steele reservoir, filed on April 12, 1935, was approved by the State Engineer on April 22, 1935.

The amended application and revised plans and specifications providing for modification of the design of the San Gabriel dam No. 1 were disapproved

(Continued on page 32)

Building Six Santa Clara Valley Dams

(Continued from page 31)

by the State Engineer on May 8, 1935, after exhaustive study of the plans and site by the personnel of the Division, aided by board of consulting engineers consisting of Professor Charles D. Marx, F. C. Herrmann and W. L. Huber.

Work is under way on all six of the dams of the Santa Clara Valley Water Conservation District. On the Coyote dam the contractor has completed the roadways to the structure, has moved in his equipment and is proceeding with the stripping. At the Calero dam the outlet conduit has been installed, the cutoff trench completed across the streambed section of the site and fill is being placed. At the Almaden and Guadalupe dams preliminary stripping only is under way. The Vasona dam is nearing completion. Excavation of the cutoff trench and stripping of the site is under way at Stevens Creek dam.

The timber facing has been placed on the San Gabriel No. 2 dam and work is in progress in asphalting the joints and completing a section of cutoff.

Maintenance inspections and inspections of repair work under way have been carried on as usual in addition to the construction work.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work is rapidly nearing completion on compilation of the 1933 and 1934 Water Supervisor Reports which will comprise the records of all diversions, stream flow, return flow and delta salinity.

With a discharge of 65,000 second feet in the Sacramento River at Sacramento in the latter part of April, this flow has only diminished very slowly so that on May 21st there was still a discharge of 40,000 second feet. This is reflecting the runoff from a snowpack very close to normal. With this flow the lower delta channels and Suisun Bay have been kept practically free of salinity as shown by the following tests for samples taken on May 14, 1935.

Salinity at Upper Bay and Delta Stations on May 14, 1935

Station	Salinity in parts of chlorine per 100,000
Point Orient	880
Bulls Head	40
O and A Ferry	4
Collinsville	1
Emmaton	2
Antioch	5
Dutch Slough	2
Rindge Pump	2
Middle River	1

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty-six applications to appropriate water were received during April, 19 were denied and 24 were approved. In the same period 3 permits were revoked and 23 passed to license. Mining continues to predominate in the size of the projects involved and the activity of the appropriators.

Field work in connection with inspection of projects reported complete and investigation of miscellaneous matters was initiated on April 15th. During the current season 219 projects will be inspected, calling for visits to practically every county in the State.

Water Distribution.

Water master service in the following districts for the 1935 season was commenced about May 1st: Hat Creek, Burney Creek and Cow Creek Water Master Districts (Shasta County).

Water master service in the following districts was continued through the month: Owl, Soldier, Emerson, Cedar, Deep and Mill Creek Water Master Districts (In Surprise Valley, Modoc County); New Pine, Davis and Franklin Creek Water Master Districts (In Goose Lake Valley, Modoc County); South Fork Pit River, Pine Creek, Hot Springs Valley, and Big Valley Water Master Districts (Modoc and Lassen Counties); Shasta River Water Master District (Siskiyou County).

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Office work in connection with the Treadwell Quadrangle in Kern County was completed during April. This is a cooperative sheet.

Office work was completed also on the Parkfield No. 1 and Dudley No. 2 Quadrangles in Kings, Fresno, Monterey and San Luis Obispo Counties and progress was made in connection with the Yreka Quadrangle in Siskiyou County. These three quadrangles are Federal sheets.

Progress was made also in the field in connection with the mapping of Federal quadrangles of Burney in Siskiyou County and Paynes Creek in Tehama County.

WATER RESOURCES

South Coastal Basin.

Work on the South Coastal Basin Investigation continued along routine lines during the month.

Central Valley Project.

Final action has not been taken on the financing of the Central Valley Project by Federal authorities in Washington. Reports indicate that the project will receive Federal approval and that an initial amount will be allocated to the first year's work. However, definite decision has not been reached as to whether funds will be made available to California to carry it on as a State project or whether it will be constructed by Federal agencies as a Federal project. The State Engineer is following the situation closely in Washington and is hopeful that a decision will be reached regarding the construction of the project within the next two weeks.

APPORTIONMENT OF ONE-FOURTH CENT GAS TAX TO CITIES FOR BIENNIUM ENDING JUNE, 1935—Continued

(Continued from page 27)

District	City or town	Symbol	County	Abbreviation	Population	Total allocation
VII	Ojai	Oji	Ventura	Ven	1,468	1,821 06
VIII	Ontario	Ont	San Bernardino	S.Bd.	13,583	16,849 76
VII	Orange	Ora	Orange	Ora	8,066	10,005 90
III	Orland	Orl	Glenn	Gle	1,195	1,482 40
III	Oroville	Ovl	Butte	But	3,698	4,587 38
VII	Oxnard	Oxn	Ventura	Ven	6,285	7,796 56
V	Pacific Grove	P.Gr.	Monterey	Mon	5,558	6,894 72
IV	Palo Alto	P.A.	Santa Clara	S.Cl.	13,652	16,935 35
VI	Parlier	Par	Fresno	Fre	564	699 64
VII	Pasadena	Pas	Los Angeles	L.A.	76,086	94,384 92
V	Paso Robles	Ps.Rs.	San Luis Obispo	S.L.O.	2,573	3,191 82
X	Patterson	Pat	Stanislaus	Sta	905	1,122 66
VIII	Perris	Per	Riverside	Riv	763	946 50
IV	Petaluma	Pet	Sonoma	Son	8,245	10,227 95
IV	Piedmont	Pdmt	Alameda	Ala	9,333	11,577 62
IV	Pinole	Pin	Contra Costa	C.C.	781	968 83
IV	Pittsburg	Pit	Contra Costa	C.C.	9,610	11,921 23
VII	Placentia	Plcn	Orange	Ora	1,606	1,992 25
III	Placerville	Plcr	El Dorado	E.D.	2,322	2,880 45
IV	Pleasanton	Ple	Alameda	Ala	1,237	1,534 50
X	Plymouth	Ply	Amador	Ama	343	425 49
I	Point Arena	Pt.A.	Mendocino	Men	385	477 59
VII	Pomona	Pom	Los Angeles	L.A.	20,804	25,807 43
VI	Porterville	Ptrv	Tulare	Tul	5,303	6,578 39
II	Red Bluff	R.Bl.	Tehama	Teh	3,517	4,362 85
II	Redding	Rdg	Shasta	Sha	4,188	5,195 23
VIII	Redlands	Rld	San Bernardino	S.Bd.	14,177	17,586 61
VII	Redondo Beach	Rdo.B.	Los Angeles	L.A.	9,347	11,594 98
IV	Redwood City	Rdw.C.	San Mateo	S.M.	8,962	11,117 39
VI	Reedley	Reed	Fresno	Fre	2,589	3,211 66
VIII	Rialto	Ria	San Bernardino	S.Bd.	1,642	2,036 91
IV	Richmond	Rch	Contra Costa	C.C.	20,093	24,925 43
X	Rio Vista	R.Vs.	Solano	Sol	1,309	1,623 82
X	Riverbank	Rvbk.	Stanislaus	Sta	803	996 12
VIII	Riverside	Riv	Riverside	Riv	29,696	36,837 98
III	Rocklin	Roc	Placer	Pla	724	898 13
III	Roseville	Rsv	Placer	Pla	6,425	7,970 23
IV	Ross	Ros	Marin	Mrn	1,355	1,680 88
III	Sacramento	Sac	Sacramento	Sac	93,750	116,297 17
IV	St. Helena	S.Hla.	Napa	Nap	1,582	1,962 48
V	Salinas	Sal	Monterey	Mon	10,263	12,731 28
IV	San Anselmo	Slmo	Marin	Mrn	4,650	5,768 34
VIII	San Bernardino	S.Bd.	San Bernardino	S.Bd.	37,481	46,495 30
IV	San Bruno	S.Br.	San Mateo	S.M.	3,610	4,478 22
VII	San Buenaventura	Ven	Ventura	Ven	11,603	14,393 56
IV	San Carlos	S.Car.	San Mateo	S.M.	1,132	1,404 25
VII	San Clemente	S.Cle.	Orange	Ora	667	827 41
XI	San Diego	S.D.	San Diego	S.D.	147,995	183,588 27
VII	San Fernando	S.Fr.	Los Angeles	L.A.	7,567	9,386 89
IV	San Francisco	S.F.	San Francisco	S.F.	634,394	786,967 76
VII	San Gabriel	S.Gb.	Los Angeles	L.A.	7,224	8,961 39
VI	Sanger	Sgr	Fresno	Fre	2,967	3,680 57
VIII	San Jacinto	S.Jc.	Riverside	Riv.	1,346	1,669 72
VI	San Joaquin	S.J.	Fresno	Fre	163	202 20
IV	San Jose	S.Js.	Santa Clara	S.Cl.	57,651	71,516 25
V	San Juan Bautista	S.J.B.	San Benito	S.Bt.	772	957 67
IV	San Leandro	S.Ln.	Alameda	Ala	11,455	14,209 96
V	San Luis Obispo	S.L.O.	San Luis Obispo	S.L.O.	8,276	10,266 40
VII	San Marino	S.Mro.	Los Angeles	L.A.	3,730	4,627 08
IV	San Mateo	S.M.	San Mateo	S.M.	13,444	16,677 32
IV	San Rafael	S.Rf.	Marin	Mrn	8,022	9,951 32
VII	Santa Ana	S.A.	Orange	Ora	30,322	37,614 54
V	Santa Barbara	S.B.	Santa Barbara	S.B.	33,613	41,697 03
IV	Santa Clara	S.Cl.	Santa Clara	S.Cl.	6,302	7,817 65
IV	Santa Cruz	S.Cr.	Santa Cruz	S.Cr.	14,395	17,857 04

(Continued on page 36)

Highway Bids and Awards

FOR MAY

ALAMEDA COUNTY—Under S. P. tracks at Folger Ave., R. C. structure, District IV, Route 69, Section Ber. E. T. Lesure, Oakland, $119,329; Merritt-Chapman & Scott Corp., San Francisco, $130,994; Healy-Tibbits Const. Co., San Francisco, $118,720; Bates & Rogers Const. Co., Oakland, $120,028; Clinton Const. Co., San Francisco, $121,628; MacDonald & Kahn Co., Ltd., San Francisco, $125,493; N. N. Ball & Bodenhamer Const. Co., Berkeley, $126,701, Barrett & Hilp, San Francisco, $133,899; Fredrickson & Watson Const. Co., Fredrickson Bros., Oakland, $134,617; A. Teichert & Son, Inc., Sacramento, $165,926. Contract awarded to J. F. Knapp, Oakand, $117,478.00.

HUMBOLDT COUNTY—Between Ferndale and Fernbridge 3.70 miles shoulders to be graded, select material borders constructed and curves superelevated with selected material base and plant mix surfacing (medium curing type). District I, Route 56, Section A. Contract awarded to Hemstreet & Bell, Marysville, $14,054.00.

LOS ANGELES COUNTY—0.5 Miles Northwest of Colorado Ave., Pedestrian Overhead Structure, District VII, Route 60, Section S. Mca. E. S. and N. S. Johnson, Pasadena, $12,339; R. H. Travers, Los Angeles, $13,186; Byerts & Dunn, Los Angeles, $13,912; Oscar Oberg, Los Angeles, $14,100. Contract awarded to Dighton A. Loomis, Glendale, $11,283.82.

LOS ANGELES COUNTY—Across Arroyo de los Posos and P. E. Ry. at Marengo St., R. C. girder bridge. District VII, Route 4, Section L.A. R. H. Travers, Los Angeles, $88,844; Byerts & Dunn, Los Angeles, $79,697; Oscar Oberg, Los Angeles, $87,432; Bates & Rogers Construction Co., Oakland, $77,875; Griffith Co., Los Angeles, $72,791; Bannister Field Co., Ltd., Fred E. Potts Co., Los Angeles, $72,788. Contract awarded to Bodenhomer Construction Co. and Silveria & Robbins, Oakland, $72,166.00.

LOS ANGELES COUNTY—Between Monterey Park and Mt. View Road; 4.7 miles, widen and A. C. and P. C. C. pave portions. District VII, Route 26, Section A & E Mte. Griffith Co., Los Angeles, $117,538; Gogo & Rados, Los Angeles, $122,121; Geo. R. Curtis Paving Co., Los Angeles, $127,042; Sander Pearson, Santa Monica, $127,048; J. L. McClain, Los Angeles, $128,276; United Concrete Pipe Corp., Los Angeles, $129,874; J. E. Haddock, Ltd., Los Angeles, $145,531. Contract awarded to Oswald Bros., Los Angeles, $116,509.00.

LOS ANGELES COUNTY—Across Newhall Creek, near Newhall, R.C. Girder Bridge, District VII, Route 4, Section E. Parish Bros., Los Angeles, $13,824; Oscar Oberg, Los Angeles, $14,090; Lynch-Cannon Engr. Co., Los Angeles, $16,145; Byerts & Dunn, Los Angeles, $14,862; Griffith Co., Los Angeles, $17,592; Contracting Engrs., Inc., Los Angeles, $21,012; E. S. and N. S. Johnson, Pasadena, $14,457; Oswald Bros., Los Angeles, $16,567. Contract awarded to R. R. Bishop, Long Beach, $13,730.25.

LOS ANGELES COUNTY—R. C. bridge across Tujunga Wash on San Fernando Road, District VII, Route 4, Section L.A. R. H. Travers, Los Angeles, $111,195; J. F. Knapp, Oakland, $99,779; R. R. Bishop, Long Beach, $111,906; Bates & Rodgers Construction Co., Oakland, $112,873; Lynch Cannon Eng. Co., Los Angeles, $100,398; Bannister Field Co., Ltd., Fred E. Potts Co., Los Angeles, $98,744; Oscar Oberg, Los Angeles, $97,482. Byerts & Dunn, Los Angeles, $99,342. Contract awarded to Griffith Co., Los Angeles, $91,119.95.

NAPA COUNTY—Between Yountville & Oakville about 0.2 mile graded and crusher run base and plant mixed surfacing (medium curing type) constructed. Ransome Co., Emeryville, $8,500; A. G. Raisch, San Francisco, $8,844; Pac. States Construction Co., San Francisco, $9,487. Contract awarded to Harold Smith, St. Helena, $7,804.75.

ORANGE COUNTY—R. C. girder bridge across Trabuco Creek, grade and P. C. C. pave approaches, District VII, Route 2, Section A. Oscar Oberg, Los Angeles, $42,369; Bannister Field Co., Ltd., Fred E. Potts Co., Los Angeles, $44,931; R. H. Travers, Los Angeles, $53,164; Lynch Cannon Eng. Co., Los Angeles, $53,530. Contract awarded to J. E. Haddock, Ltd., Pasadena, $39,633.00.

ORANGE COUNTY—Between 17th Street and Fairhaven Ave., 1.1 mile grade and P. C. C. or A. C. pave, District VII, Route 181, Sections S.A. and A. Griffith Co., Los Angeles, $31,820; Geo. R. Curtis Paving Co., Los Angeles, $35,580; Oswald Bros, Los Angeles, $31,739.50. Contract awarded to Mundo Eng. Co., Los Angeles, $28,543.50.

SACRAMENTO COUNTY—Between Ryde and ½ mile east of Steamboat Slough, 2.1 miles, grade, surface and armor coat. District III, Route 100, Section A. E. F. Hilliard, Sacramento, $22,791; A. Teichert & Son, Inc., Sacramento, $23,910; Ransome Company, Emeryville, $27,679; J. A. Casson, Hayward, $28,555. Contract awarded to Lee J. Immel, Berkeley, $22,572.00.

SAN BERNARDINO COUNTY—At 3d and 8th Streets in Redlands, 618 lineal feet of R. C. Box storm drain, District VIII, Route 26, Section Rld. Geo. Gardner & Sons, Redlands, $15,897; Parrish Bros., Los Angeles, $19,840; Kemper Construction Co., Los Angeles, $21,144; H. A. Taget, Ontario, $15,684; Tower Construction Co., Culver City, $20,550. Contract awarded to S. M. Milovich, Montebello, $15,422.01.

SAN DIEGO COUNTY—Between 1 mile east of Barrett and Tecate Road, 2.8 miles, grade and treat with liquid asphalt, District XI, Route 200, Section C. V. R. Dennis Construction Co., San Diego, $58,565; Sharp & Fellows Construction Co., Los Angeles, $58,767; Gogo & Rados, Los Angeles, $61,167; J. L. Connor, Monterey, $99,984. Contract awarded to Daley Corporation, San Diego, $45,437.40.

SAN DIEGO COUNTY—Park Blvd., between Russ Blvd. and Calle Colon, A. C. pave, widening and grading. District XI, Route 12, Section S.D. Daley Corporation, $17,582. Contract awarded to V. R. Dennis Construction Co., $16,789.50.

SAN DIEGO COUNTY—Between Broadway and N. City Limits in City of San Diego, 15.9 miles; shoulders to be treated with liquid asphalt. District XI, Route 2, Section SD. Morgan Bros., Huntington Park, $5,793; Lamb's Transfer Co., Long Beach, $5,865; Gilmore Oil Co., Los Angeles, $5,943. Contract awarded to Paulson & March, Inc., Los Angeles, $4,773.60.

SAN DIEGO COUNTY—Between Lake Hodges Dam and Rancho Santa Fe, 3.6 miles, grade and road-mix surface treat. District XI, Route Lake Hodges Road. Geo. J. Bock & Son, Los Angeles, $108,340; R. E. Campbell, Los Angeles, $117,092; J. E. Haddock, Ltd., Pasadena, $119,448. Contract awarded to Sharp & Fellows Construction Co., Los Angeles, $86,266.50.

SAN DIEGO COUNTY—Between Encinitas and Ocean side, 10.1 miles highway, roadside to be planted. District XI, Route 2, Section B. Rexroth & Rexroth, Bakersfield, S. A. Cummings, San Diego, $8,101. Contract awarded to Peterson Bros., Inglewood, $7,432.09.

SAN MATEO COUNTY—Widen undergrade crossing under S. P. Ry. and So. S. F. Belt Rt. at So. San Francisco, District IV, Route 68, Section B. Healy Tibbits Construction Co., San Francisco, $134,282; Chas. L. Harney, San Francisco, $167,623; Bodenhamer Construction Co., Oakland, $166,120; M. B. McGowan, Inc., and C. W. Caletti & Co., San Francisco, $142,766; Barrell & Hilp, San Francisco, $155,502. Contract awarded to Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $129,908.08.

SANTA BARBARA COUNTY—Between the west city limits of Santa Barbara and Hollister Ave., about one and six-tenths (1.6) miles in length; trees, shrubs, and ground cover to be planted. NRH 58-B (1935, District V, Route 2, Section P,K. Rexroth and Rexroth, Bakersfield, $4,922. Contract awarded to Peterson Bros., Inglewood, $3,896.18.

VENTURA COUNTY—R. C. girder bridge across Calleguas Creek, District VII, Route Camarillo State Hospital. R. R. Bishop, Long Beach, $19,109; Byerts & Dunn, Los Angeles, $21,295. Carlo Bongiovani, Hollywood, $21,939. Contract awarded to Silveria & Robbins, J. P. Immel, Ventura, $17,850.00.

Frank J. Butler, Old Blue Print Chief, Retires From Service

By **C. S. POPE**, Construction Engineer

FRANK J. BUTLER, chief of blue printing for the Division of Highways, retired from the service of the State on June 1, 1935, as one of its oldest employees and one of the oldest men in the service.

Mr. Butler came into the State service in January, 1911, through the great friendship existing between himself and Governor Hiram Johnson. In January, 1912, he was assigned to the Division of Architecture then located in the Capitol Building and under control of State Engineer McClure. This organization had a considerable amount of blue printing to do and Frank gradually worked into that line of work.

In 1912 it was decided to expand the blue printing to take over the work of the Division of Highways, and at Butler's request he was furnished with one of the new type of indoor printing machines which made him independent of sun light.

For a number of years the highways blue prints were turned out in a room in the Forum Building, but on the completion of the laboratory in 1924, the equipment was transferred to that building.

REQUIRED FOUR MEN

The work gradually expanded and what had been handled by two men required four men sometimes working day and night. In 1931 it became necessary to install an additional machine and the blue printing was moved to its present quarters in the Department of Public Works Building.

In the early days of his work, Frank used to order his blue print paper by the roll and turn out the work by the hundreds of sheets. During recent years, however, he has had to order it by the ton and turn out his work by the acre.

One of the biggest jobs the department ever handled was the preliminary tracings for the Bay Bridge, which required night and day work for a considerable period of time. The volume of work now approximates something like 200 rolls of 100 yards each per month and the cost of blue printing has been materially reduced over the earlier days.

During the many years with the Division of Highways, Frank Butler has maintained his earlier friendships with Senator Johnson, C. K. McClatchy, and many of the important men of Sacramento.

FRANK J. BUTLER

He has been a fine representative of his race, faithful in his work, and well thought of by all with whom he came in contact. Although he passed his seventy-fifth birthday in May of this year, he enjoys good health and will, no doubt, spend many years in watching others carry on the work he started.

On the day of his retirement he received letters of remembrances from Senator Johnson, Director Earl Lee Kelly, and many others. Also, he was the recipient of gifts from numerous members of the Division of Highways, and from others who wished him well.

At the brief ceremony of presentation, Mr. Butler replied with an excellent talk expressing his appreciation of the friendliness he had enjoyed with other members of the organization and his regret at leaving the work in which he had been so much interested.

Frank Butler carries with him the good will of all of the employees and their wishes for the best of health during his remaining years.

APPORTIONMENT OF ONE-FOURTH CENT GAS TAX TO CITIES FOR BIENNIUM ENDING JUNE, 1935—Continued

(Continued from page 33)

District	City or town	Symbol	County	Abbreviation	Population	Total allocation
V	Santa Maria	S.Mra.	Santa Barbara	S.B.	7,057	8,754 23
VII	Santa Monica	S.Mca.	Los Angeles	L.A.	37,146	46,079 73
VII	Santa Paula	S.Pa.	Ventura	Ven	7,452	9,244 23
IV	Santa Rosa	S.Ro.	Sonoma	Son	10,636	13,193 99
IV	Sausalito	Saus	Marin	Mrn	3,667	4,548 92
VII	Seal Beach	Sl.B.	Orange	Ora	1,156	1,434 02
IV	Sebastopol	Seb	Sonoma	Son	1,762	2,185 77
VI	Selma	Sel	Fresno	Fre	3,047	3,779 81
VII	Sierra Madre	Sie.M.	Los Angeles	L.A.	3,550	4,403 79
VII	Signal Hill	Sig.H.	Los Angeles	L.A.	2,932	3,637 16
V	Soledad	Sol	Monterey	Mon	594	736 86
IV	Sonoma	Son	Sonoma	Son	980	1,215 69
X	Sonora	Sra	Tuolumne	Tuo	2,278	2,825 87
VII	South Gate	S.Gt.	Los Angeles	L.A.	19,632	24,353 56
VII	South Pasadena	S.Pas.	Los Angeles	L.A.	13,730	17,032 11
IV	South San Francisco	S.S.F.	San Mateo	S.M.	6,193	7,682 44
X	Stockton	Stkn	San Joaquin	S.J.	47,963	59,498 25
X	Suisun	Suis	Solano	Sol	905	1,122 65
IV	Sunnyvale	Sunv	Santa Clara	S.Cl.	3,094	3,838 12
II	Susanville	Susv	Lassen	Las	1,358	1,684 60
X	Sutter Creek	St.Ck.	Amador	Ama	1,013	1,256 63
VI	Taft	Taf	Kern	Ker	3,442	4,269 81
VI	Tehachapi	Thpi	Kern	Ker	736	913 01
II	Tehama	Teh	Tehama	Teh	190	235 70
VII	Torrance	Tor	Los Angeles	L.A.	7,271	9,019 70
X	Tracy	Tra	San Joaquin	S.J.	3,829	4,749 89
I	Trinidad	Trnd	Humboldt	Hum	107	132 73
VI	Tulare	Tul	Tulare	Tul	6,207	7,699 80
X	Turlock	Tur	Stanislaus	Sta	4,276	5,304 39
VII	Tustin	Tus	Orange	Ora	926	1,148 71
I	Ukiah	Uki	Mendocino	Men	3,124	3,875 33
VIII	Upland	Upl	San Bernardino	S.Bd.	4,713	5,846 49
X	Vacaville	Vac	Solano	Sol	1,556	1,930 22
X	Vallejo	Val	Solano	Sol	14,476	17,957 52
VII	Vernon	Ver	Los Angeles	L.A.	1,269	1,574 20
VI	Visalia	Vis	Tulare	Tul	7,263	9,009 78
IV	Walnut Creek	Wl.C.	Contra Costa	C.C.	1,014	1,257 87
IV	Watsonville	Wat	Santa Cruz	S.Cr.	8,344	10,350 76
VII	West Covina	W.Cov.	Los Angeles	L.A.	769	953 95
III	Wheatland	Wht	Yuba	Yub	479	594 20
XI	Westmorland	Wmd.	Imperial	Imp.		
VII	Whittier	Wit	Los Angeles	L.A.	14,822	18,386 74
III	Williams	Wms	Colusa	Col	851	1,055 67
I	Willits	Wlts	Mendocino	Men	1,424	1,766 48
IV	Willow Glen	Wlw.G.	Santa Clara	S.Cl.	4,167	5,169 18
III	Willows	Wlos	Glenn	Gle	2,024	2,510 78
III	Winters	Win	Yolo	Yol	896	1,111 49
III	Woodland	Wd	Yolo	Yol	5,542	6,874 87
II	Yreka	Yre	Siskiyou	Sis	2,126	2,637 31
III	Yuba City	Y.C.	Sutter	Sut	3,605	4,472 01
	Grand total					$5,291,693 72

"For the last time," shouted the sergeant, "I ask you the simple question, 'What is fortification?'"

The recruits stood fast to a man. No one answered. Striding up to the most intelligent looking man, the N. C. O. bawled out, "Tell me, what is a fortification?"

The answer came back like a cork out of a bottle. "Two twentifications, Sergeant."

—*Carnegie Tech. Puppet.*

Girls when they went out to swim,
Once dressed like Mother Hubbard;
Now they have a bolder whim,
They dress more like her cupboard.

Gladys—What is your favorite sport?
Young Doctor—Sleighing.
Gladys—No, I mean apart from business.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

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DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
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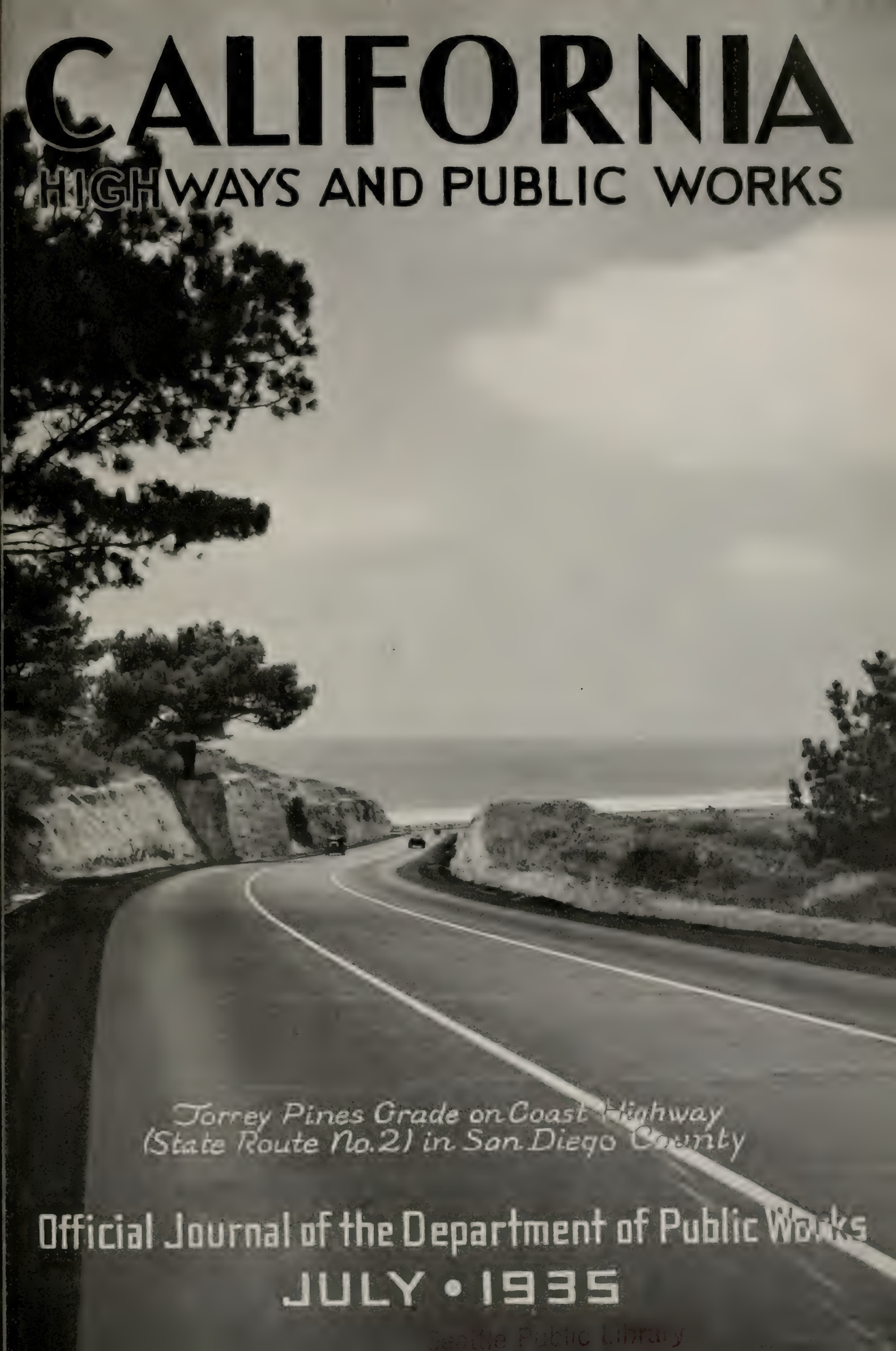

Torrey Pines Grade on Coast Highway
(State Route No. 21) in San Diego County

Official Journal of the Department of Public Works
JULY • 1935

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Governor Merriam Starts First Cable Spinning Operations on the Bay Bridge

Chief Executive Makes Adventurous Inspection Tour Over Wire Mesh Catwalk Swung at Dizzy Height Above Water to Talk With Workers on Job

"IF IT IS safe enough for our workmen, it is safe enough for me."

With this declaration, Governor Frank F. Merriam walked out over one of the steel mesh catwalks that rise to dizzy heights over the San Francisco Bay on the first mile of the San Francisco-Oakland Bay Bridge, after he had started cable spinning operations by placing the first loop of wire on the spinning wheel on June 15 last.

With the Governor were State Director of Public Works Earl Lee Kelly, Chief Engineer C. H. Purcell, and Ambrose N. Diehl, president of the Columbia Steel Company, contractors.

After performing his official function, Governor Merriam expressed a desire to go out on the catwalks. Some of his advisors protested, but the Governor was adamant, and his advisors, timid or otherwise, were forced to trudge after the Governor up the steep incline of horizontal fence wire through which they could see the bay and huge ships far below.

GOVERNOR MERRIAM Promenades on Catwalk

Governor Merriam paused frequently to talk with the steel workers at their airy posts.

On his first trip the contractors were still adjusting the cable spinning equipment, with frequent instances when the wire jumped off the spinning wheel. On the fifth of July, Governor Merriam again inspected the operations, when it was in full force with several hundred wires already laid in the cable.

As Governor Merriam and his party toiled up the steep incline of the catwalks, they would be warned by the tinkling of a cow bell fastened on the wheel, of the approach of the cable spinning apparatus dragging behind it a flopping steel wire.

The Governor and his party are the only persons, other than cable spinners and inspectors, who have been permitted on the catwalks during the spinning operations.

News reel camera men representing all the companies operating in America photographed the San Francisco-Oakland Bay Bridge on the occasion of the

Spinning Bridge Cables Across Bay

(Continued from preceding page)

Governor's second visit to the catwalks. The news reels represented were: Pathe, Hearst-Metrotone, Universal, Paramount, and Fox-Movietone. If these pictures of the cable spinning meet the standards of the Eastern editors, they will be disseminated throughout America before the end of July.

The spinning is now taking place on the most westerly of the twin suspension bridges. Two loops of the pencil-sized wire are carried in the two grooves of the wheel over the top of the towers and then to the center anchorage. Another spinning wheel returns with two loops of wire bound for the San Francisco anchorage simultaneously.

The spinning wheels are hung from an endless hauling cable similar to the pulley rope of a clothes line. Thus two spinning wheels are operating on each main cable, but in opposite directions.

Several hundred men of the cable spinning crew line the mile long catwalks seizing the wire as it comes along, and forcing it into grooves where its height is checked to a guide wire.

The new safety catwalks have been found by Chief Engineer C. H. Purcell and his staff to be highly satisfactory. The open catwalk wire, bad for dizzy heads, is ideal for preventing wind swaying in these sky promenades.

With four strands completed in each of the cables of the western half of the suspension sector, preparations are under way for raising the catwalk ropes for the eastern sector from the center anchorage to the island.

THE SPINNING WHEEL is 5 feet in diameter and carries two loops of the pencil size cable wire on each trip traveling 7 miles an hour.

Several days were spent adjusting to correct elevation the four strands completed on the south catwalk. Since the sags of the completed cable depend upon the correct adjustment of these first four strands, a high degree of precision is required in the position of the wire already spun.

Night and day crews of men, supervised by State bridge engineers, check the height of the cable wires and correct those out of position by mechanical leverage devices.

Spinning of the next four strands on the south walk were started while the adjustment of the four strands on the north walk was taking place.

By mechanical devices it is provided that any slack is immediately taken up by brakes applied to the huge spools of cable wire. In addition to this mechanical control of slack, an electrical system of switches is provided at 250-foot intervals over the entire catwalk so that in case of accident or a snarled wire all movement can be immediately shut down by the workmen witnessing the accident.

The wheels travel approximately seven miles an hour over the one mile course. Each cable strand contains 472 wires so that each strand requires 236 trips of the spinning wheel. Except for the center, or nineteenth strand, which is laid up by itself, the strands are spun in sets of four, each set being adjusted to correct elevation before starting succeeding strands. There will be 37 strands, or a total of 17,464 individual wires in each main cable, and the spinning will be completed this year.

TWIXT HEAVEN AND EARTH, suspended on a three-foot walkway between two catwalks of the San Francisco-Oakland Bay bridge, 350 feet above the bayshore, Governor Merriam and his official party inspected the cable spinning and posed for photographers. With the Governor in upper picture is Director of Public Works Earl Lee Kelly. Below, left to right, are W. G. Swanson; James Ward, American Bridge Co.; E. J. Schneider, President A. M. Diehl and Jack Fox of Columbia Steel Co.; Assistant Director of Public Works Justus F. Craemer; Governor Merriam, Director Kelly and Chief Engineer C. H. Purcell.

Two Important Federal Aid Routes in San Francisco Widened by State

By **JNO. H. SKEGGS,** District Engineer, District IV

THE completion of the Bay Shore Highway by the State Division of Highways from the south city boundary of San Francisco to the Santa Clara-Alviso road, near Santa Clara and San Jose, and the completion within the City and County of San Francisco of the Bay Shore Highway from the south city boundary to Army street, created heavy traffic congestion on Potrero avenue and Tenth street as arteries between the business area of San Francisco and the Peninsula points.

The former street widths of these two links were such as to congest traffic during a great portion of the daylight hours, especially peak hours and the late afternoon and early evening.

With federal funds available to finance the work out of an allotment of $600,000 to be spent within the City and County of San Francisco the roadway to Potrero avenue was widened through the setting back of curbs to provide a uniform width of 72 feet between newly constructed curbs.

TRACKAGE RECONSTRUCTED

The Municipal Railway tracks in Potrero avenue were formerly the Ocean Shore Railroad trackage and were on 15 foot centers. To provide the two traffic lanes and a parking lane on each side of the car tracks it was necessary for the Municipal Railroad to reconstruct the trackage, reducing the centers between the tracks.

The major work on Potrero avenue consisted therefore of setting back curbs; replacing sidewalks; widening the existing pavement with portland cement concrete and resurfacing the existing pavement with asphalt concrete.

The widening and resurfacing of Potrero avenue, the most important link from the Bay Shore Highway to the business district, still left the arterial incomplete to the Civic Center; therefore the work of widening Tenth street from Potrero avenue to Market street, Van Ness and the Civic Center, was also undertaken and the work consisted of setting back curbs, constructing a portland cement concrete parking strip and resurfacing the old pavement with asphalt concrete.

ARTERIALS TO BRIDGE

The Market Street Railway had previously removed their trackage on Tenth street, leaving the newly constructed street an unobstructed arterial solely for highway traffic.

It is now possible to traverse newly constructed and reconstructed highways from Market street, San Francisco, directly into San Mateo and Santa Clara counties via the Bay Shore Highway.

Basically these two highways have been included in the highway system primarily to serve as arterials leading directly to approaches to the San Francisco-Oakland Bay Bridge. Bryant street and Harrison street from Tenth to Fifth street are also included under the same appropriation for widening and resurfacing as units which will lead traffic directly to the bridge entrance in Fifth street.

WIDENED TO 72 FEET

In April, 1934, a contract was awarded for widening Potrero avenue, from Division street to Army street, 0.85 mile, by placing portland cement concrete pavement strips seven feet wide and 0.6 foot thick on each side of the existing roadway, and resurfacing the remainder of pavement with asphalt concrete. Existing tracks of the Municipal Railroad being on 15-foot centers (wider than standard practice) required reducing to Municipal Railroad normal centers of approximately 11 feet.

A net distance between curbs of 72 feet was obtained, which, after allowing for parking on new concrete widening strip, leaves room for two lanes of travel on each side of railway area.

Major contract items included 1274 cubic yards of roadway excavation, 28,454 square yards of asphalt concrete surface and 4442 cubic yards of portland cement concrete removed; 4646 cubic yards of portland cement concrete pavement placed; 2133 tons of crusher run and 3142 cubic yards of ballast placed; 10,719 tons of asphalt concrete laid, and 11,817 lineal feet of granite curbs reset with 327 lineal feet of new curb placed.

Moving of trolley poles, span and feed

(Continued on page 11)

TWO CITY ARTERIALS on Federal Aid routing through San Francisco—Potrero Avenue and Tenth Street—have been rebuilt to modern traffic standards to serve as thoroughfares leading to the approaches of the San Francisco-Oakland Bay Bridge. Potrero Avenue has been widened and resurfaced to 72 feet between curbs, to provide two traffic lanes and a parking lane on each side of the car tracks. Extending the improvement to the Civic Center, Tenth Street was also widened and resurfaced. The two upper pictures show portions of the Potrero Avenue improvement looking northward from Twenty-fourth Street past the County Hospital and northward from Seventeenth Street. The improved Tenth Street, looking south from Market Street and another section looking into Potrero Avenue, are shown in the two bottom pictures.

Tunnel of Unusual Design to Carry Coast Highway Through Santa Monica

By **C. W. JONES,** Senior Bridge Engineer, Southern Office

THE urgent demand of traffic for a high standard coast highway to accommodate through travel in the highly congested metropolitan beach resort area has prompted the state to build a tunnel at Santa Monica. The construction of this tunnel will eliminate the necessity of climbing the Palisades bluff, will eliminate the crossing of main city streets and will eliminate the crossing of the railway tracks on Ocean avenue in the city of Santa Monica.

Upon the completion of the tunnel road project, through traffic proceeding south along the Coast Highway may go through the bluffs and under the intersection of Colorado street and Ocean avenue and under the tracks of the Pacific Electric Railway and then continue south on Lincoln boulevard toward San Diego. Following this state highway route, traffic will be able to avoid the congested areas in the cities of Los Angeles and Santa Monica.

After passing through the tunnel that portion of traffic which so chooses may turn onto one of several boulevards and enter the city of Los Angeles. In addition to serving through state highway travel, this new tunnel road will be a valuable arterial to the population of the southland in that it will provide a good, fast and safe road to and from the beach area, which additional road is sorely needed, especially on week ends and holidays during the summer months when the beaches and highways are crowded.

UNUSUAL IN DESIGN

The new tunnel will be 400 feet long and will be one of the widest in the state.

Physical conditions made economical design of the tunnel somewhat unusual. This unusual design together with existing interferences affects the method of construction.

In order to secure satisfactory alignment at reasonable cost it was found necessary to build the tunnel on a curve and make it cross under a portion of the Palisades Park area. Portions of the park disturbed will be replaced after the tunnel is completed.

In order to secure necessary vertical clearance without dropping the tunnel floor to such extent as would make necessary the reconstruction of a valuable sewer system, or on the other hand raising the top of the tunnel to such extent that a hump would appear in the tracks and street above, the designers were forced to work out a very flat type of construction which utilizes every available inch of space.

CONCRETE PILE FOUNDATION

While the biblical injunction to found structures on rock is sound, the designers, upon making their investigations, found that the ground upon which the tunnel had to be built was not rock and that it was not capable of safely supporting the load they proposed to place upon it. It was therefore decided to reinforce the ground by driving concrete piles into it so that the piles might act as a substitute for rock.

Traffic counts taken along the beach highway show that the road is one of the most heavily traveled highways in the state. In order to accommodate this traffic a structure 56 feet in width will be provided which will accommodate four lanes of traffic. This width will also provide room for pedestrian sidewalks on each side of the highway.

To insure that the eroding bluffs will not cave or slide down onto the highway and endanger traffic, retaining walls will be constructed at the ends of the structure.

CARRIES ENTIRE SURFACE WEIGHT

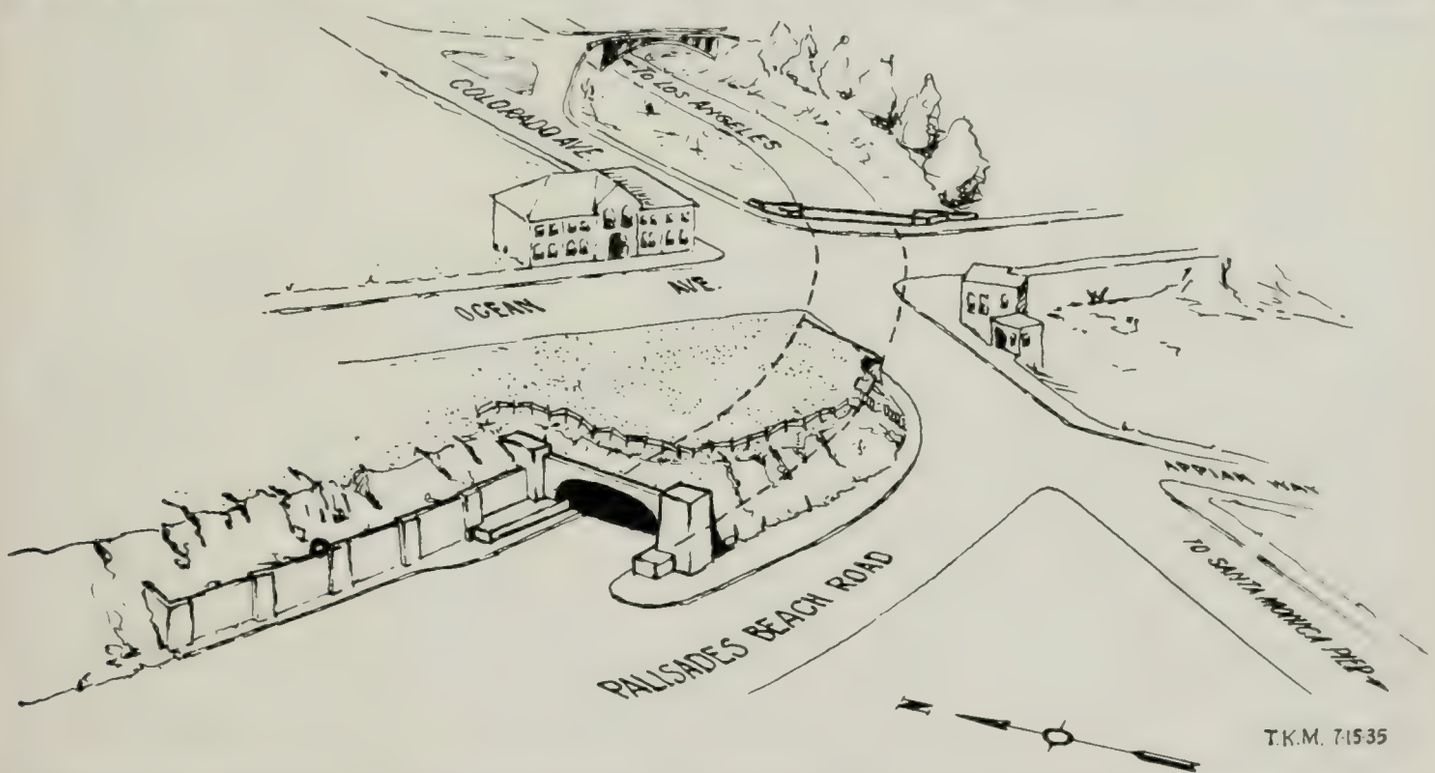
Although many tunnels are designed to support only a portion of the dirt above them, the theory being that the ground to some extent acts as a natural supporting arch, in the Santa Monica tunnel the structure has been designed to safely carry the entire weight of the earth above it. In the case of this structure the depth of earth above it will be small.

In order to secure good lighting, the tunnel floor will be white, tile walls will be used for some distance up the sides, and electric lights will be installed.

The architects were consulted on matters of esthetics and it is believed that the simple

(Continued on page 10)

OPEN CUT CONSTRUCTION from the Beach road through Palisades Park and Ocean Avenue at Santa Monica to build tunnel for new highway. Part of old railroad tunnel shows in foreground.



SKETCH MAP showing route of tunnel from Beach Road under park and avenue in Santa Monica.

TEMPORARY TRESTLES for pedestrians and trolley cars are provided for the traffic on Ocean Avenue and to numerous beach resorts, especially heavy on weekends and holidays.

Bond Issue Building Program Will Provide 4705 Men With a Year's Work

THE voters of California will be faced with the responsibility on August 13th of providing adequate accommodations for patients in state mental hospitals and feeble-minded institutions.

The California Legislature at its last session, realizing the critical conditions in these institutions, adopted a proposed constitutional amendment providing a bond issue of $13,950,000 for this purpose without a dissenting vote. The act is known as the State Building Bond Act of 1935. The proceeds will be used for constructing buildings at state institutions, state prisons and extensions to the state buildings at Sacramento and Los Angeles.

The administration of the act is vested in the State Building Commission composed of Director Earl Lee Kelly of the Department of Public Works; Director of Finance Arlin E. Stockburger; Director of Institutions Harry Lutgens and two members to be appointed by the Governor.

WORK FOR 4705 MEN

All construction work will be under the supervision of the Department of Public Works and the Division of Architecture will prepare all plans and specifications and see that the work is carried out in accordance with the contracts as awarded by Director Earl Lee Kelly.

The projects contemplated are located in all sections of the state and will afford considerable relief for unemployment. It is estimated by the Department of Public Works that 4705 men will be employed on these projects for a year in addition to the vast amount of building materials and other services that will be required.

Funds in the Governor's budget and tentative allotment of money from the proceeds of the bond issue provide for buildings and construction at Pacific Colony near Pomona, Mendocino State Hospital at Ukiah, Agnews State Hospital near San Jose, Napa State Hospital at Napa, Patton State Hospital near San Bernardino, Camarillo State Hospital near Ventura, Norwalk State Hospital at Norwalk, Stockton State Hospital at Stockton, Sonoma State Home at Eldridge, and a new prison in southern California.

LARGE BUILDING PROGRAM

At Pacific Colony seven new ward buildings with accommodations for 560 beds are planned at a cost of $560,000 in addition to water development and additions to heating plant, school and industrial units, making a total of $765,500.

At Mendocino State Hospital a custodial unit accommodating 334 patients is contemplated, together with two ward buildings for 540 patients and other minor units which will total $595,000.

At Agnews State Hospital two ward buildings are contemplated for a capacity of 800 patients, heating plant and water system and a treatment building for 100 patients at a total cost of $870,000.

At Napa State Hospital it is proposed to build a receiving and medical unit with accommodations for 125 patients, two ward buildings with accommodations for 200 patients, and a ward group for 400 patients, with additions to the heating plant, at a cost of approximately $900,000.

RELIEF FOR STATE HOSPITALS

At Patton State Hospital ward buildings at the main institution and the farm colony are proposed, together with a receiving and medical unit and employees' quarters, at a cost of approximately $775,000.

At Camarillo State Hospital the male custodial group will be completed to accommodate 1100 patients, together with the female custodial unit to accommodate 1500 patients, a medical unit with 100 beds, together with industrial buildings, dining room, employees' quarters, farming units, heating, refrigeration, laundry and other facilities amounting to approximately $4,000,000.

At Norwalk State Hospital a new ward building and treatment unit, together with boiler piping, etc., to accommodate 220 patients at a cost of $330,000 is contemplated.

At Stockton State Hospital eight new ward buildings at the farm to accommodate 960 patients will be constructed, together with additional kitchen, dining room and other facilities, employees' quarters, heating and sewage plant and kitchen and bakery, at a cost of $1,089,000.

At Sonoma State Home proposed plans call for seven new ward buildings to accommodate 560 patients, together with a water and sewage plant, at a total cost of $575,000.

NEW PRISON IN SOUTH

In addition to this building program in state institutions the bond issue provides for an item of $5,500,000 for the purchase of a site and construction of a new prison in southern California. It is hoped to amplify this amount from federal funds, making a total of $6,000,000 available.

The population of the state's mental hos-

INSANITARY DILAPIDATED WOODEN SHACKS, known as the Dozier cottages, built in 1907 as temporary structures at Napa Hospital, still house 386 women mental patients, including tuberculosis cases.

PATIENTS SLEEP ON FLOOR in H. ward, Napa State Hospital, where overcrowding of semi-violent mental cases has reached the point where beds are laid down in hallways.

pitals is mounting day by day. As of June 30 the number of persons in these institutions was 19,437. They are crowded into buildings that were built to accommodate but 14,325.

This makes an excess population as of June 30, of 5112 or 35.69 per cent. These figures mean that the Department of Institutions has been forced to use every available bit of space in the institutions for beds. Wards that were built to accommodate 30 patients have in many instances more than double that number. Basements have been converted into wards as well as attics. Day rooms built for patients' recreational centers are being utilized for sleeping quarters and temporary beds are placed in the corridors at night.

The result of this overcrowding and makeshift bed arrangement has an extremely detrimental effect upon the improvement or recovery of the patient. In addition the sanitary conditions are not conducive to the patients' health and the additional burden placed upon

(Continued on page 10)

Increased Hospital Facilities Needed for Past 5 Years

(Continued from page 9)

the personnel of the institutions results in greatly reduced efficiency.

The population of California's mental hospitals has been increasing at the rate of one thousand persons a year during the past five years. During that time no new buildings have been put into occupancy for patients and that is the cause of the situation which now confronts the people of this state.

While the average of mental patients per 100,000 population in California is slightly in excess of that throughout the United States that is not the reason for our great increase in mental hospital population. The increase is in direct ratio to the influx of new residents and increased population of the state.

Therefore, as our state grows, the financial responsibility in caring for the state's wards grows.

Governor Frank F. Merriam and members of both houses of the legislature realize the critical situation which confronts the state in the care of its mental patients and inmates of state prisons and it is through their efforts that this issue is being presented directly to the people.

The adoption of this building program will enable the state to participate in the Federal works program so that the amount provided may be increased materially by Federal funds.

The Division of Architecture of the Department of Public Works, has estimated that the building involved will require a total of 9,410,000 man-hours of direct and indirect labor which would be equal to the steady employment for one year of 4705 men.

The following table shows the location, cost and man-hours of labor required for each project:

Location	Allocated amount	Direct Const. man-hours	Indirect shop-etc. man-hours	Total man-hours
Patton State Hospital	$395,000	178,000	98,000	276,000
Stockton State Hospital	40,000	18,000	10,000	28,000
Camarillo State Hospital	3,879,000	1,745,000	970,000	2,715,000
Norwalk State Hospital	200,000	90,000	50,000	140,000
Mendocino State Hospital	595,000	268,000	148,000	416,000
Agnews State Hospital	1,140,000	513,000	285,000	798,000
Napa State Hospital	910,500	410,000	227,000	637,000
Sonoma State Home	575,000	258,000	143,000	401,000
Pacific Colony	765,500	344,000	191,000	535,000
New Prison, So. Calif.	3,500,000*	1,350,000	750,000	2,100,000
Capitol Ext., Sacramento	950,000	427,000	237,000	664,000
Office Bldg., Los Angeles	1,000,000	450,000	250,000	700,000
Totals	$13,950,000	6,051,000	3,359,000	9,410,000

Estimated total man-hours—9,410,000.

* $500,000 allocated for site.

Santa Monica Tunnel Being Constructed by Open Cut Method

(Continued from page 6)

treatment at the tunnel portals will be pleasing in appearance.

OPEN CUT METHOD

Although the usual practice in the construction of tunnels is to burrow through the hill, in the case of this tunnel it was found cheaper to make an open cut and build the barrel as a culvert and then replace the dirt, park and streets above. A portion of the street will be almost flush with the crown of the tunnel arch.

The Pacific Electric tracks cross over the tunnel. It was found that railway service could not well be interrupted. A temporary trestle was therefore constructed to carry the rail traffic over the construction and the tunnel will be built beneath the tracks. When the trestle is finally removed, concrete will be used to plug the holes in the barrel in places previously occupied by trestle underpinning.

In connection with the building of the tunnel it has been necessary to shift or alter numerous interfering pole and pipe lines, reconstruct the street drainage system, provide accommodation across the closed streets for the crowds of pedestrians proceeding to and from the beach and also safeguard existing buildings. It was found desirable to remove an existing arch bridge adjacent to the work and backfill the area with tunnel excavation.

The plans for the project were prepared by the Division of Highways and approved by the U. S. Bureau of Public Roads since federal aid is being employed to help defray the cost. The city of Santa Monica, making use of its own funds and labor furnished by the Federal government, is cooperating in part of the street improvement and the park work.

As in the case of all state highway contracts, a resident engineer employed by the state is continuously on the job during construction to insure that the structure is built strictly in accordance with contract plans and specifications.

This $200,000 project is progressing on schedule and it is expected that the work will be completed and traffic will be enjoying the use of the new tunnel road shortly after Christmas.

Two Federal Aid Arterials Widened in San Francisco

(Continued from page 4)

wires and risers, and new and adjusted manholes, catch basins and many other minor items were included in the contract.

The contract was carried on at the same time that a number of other city and private contracts were under way on the street, these contracts covering placing of tracks, new high and low pressure water mains, a gas line and power and telephone lines.

Total cost of the contract was $145,352.

Fell street, from Van Ness avenue to Market street, and Tenth street, from Market street to Division street, a total of 0.9 mile, were widened five feet on each side, with portland cement concrete, and the remainder of the roadway resurfaced with asphalt concrete. Net widths of 48 feet 9 inches and 60 feet respectively were obtained.

Contract for this portion was let in May, 1934. Major contract items included 5146 tons of crusher run base, 5728 tons of asphalt concrete, 1184 cubic yards of portland cement concrete pavement, 7346 lineal feet of granite curbs being reset, and 616 feet of new curb placed. The approximate cost was $71,000.

These two projects, as completed, are splendid examples of wide highways in cities; and, with the comprehensive system of traffic stripes and markers as placed (a broad, double stripe in the center), safely and easily guide traffic to the south of Market business area, with the terminus adjacent to the Civic Center, allowing of diffusion of traffic to north of Market business area and the various residence districts.

The construction of these two projects completes the Bay Shore Highway system connection to San Francisco, and the projects now under way, namely, Bryant and Harrison streets, Fifth street to Tenth street, Fifth street from Bryant street to Harrison street, and the San Francisco approach, Fifth street to the San Francisco-Oakland Bay Bridge, will provide broad and easy connection to the bridge and East Bay cities.

Don't feel flattered when people call you a good egg. A good egg is the kind you can use.

"My wife has been nursing a grouch all the week."
"Been laid up, have you?"—*Christian Science Monitor.*

QUIT YOUR GROUCHIN'

BY FRANK M. COLVILLE

Assistant Editor, Right of Way

Cut out the grumblin' an' cussin',
  An give your old jaw bones a rest,
Maybe the fellow you're naggin'
  Is doin' his dead level best;
And you hain't a goin' to help him
  By proddin', or askin' him why
He wasn't workin' lots faster?
  Just 'cause you're standin' near by.

There's danger in too much complainin'
  And sometimes things go all to smash,
Just' cause the big guy, that's a bossin',
  Gets up in the air and acts rash;
For the fellow that's doin' the diggin'
  Likes a boost, or occasional smile,
And better results will sure follow
  If you jolly him once in a while.

There's nothin' to gain by fault-findin',
  An' sometimes it sure comes to pass,
That you'll find some conspicuous blunders
  If you look at yourself in the glass.
If you try to be pleasant an' human,
  Folks are apt to be decent to you;
If you're kindly, an' white, an' obligin',
  You'll find others honest and true.

So cut out the rough stuff, quit ballin',
  Get your face limbered up for a smile,
Spill out great gobs of contentment,
  Go light on the wormwood an' bile;
Don't act like a savage, or cave-man,
  In his sort of half-civilized day.
It costs to be ugly and grouchy,
  It pays to be cheerful an' gay.

District Engineer Wallace Wins Praise

District Engineer E. E. Wallace, of District XI, Division of Highways, with headquarters in San Diego, has won the commendation of State Highway Engineer C. H. Purcell for his "initiative and success in securing the passage of parallel parking ordinances in towns on the Coast Highway (State Route No. 2) between the Orange County line and the city limits of San Diego."

Anticipating a greatly increased traffic over the highways in his district, on account of the San Diego Exposition, Mr. Wallace sought the cooperation of the City Council of Oceanside and the San Diego County supervisors and succeeded in having parallel parking established in all towns, both incorporated and unincorporated, on over 70 miles of the heavily traveled Coast Route.

The original knee-action vehicle was the bicycle.

Eight Contracts Completed on State Street Project in Long Beach Area

By **JULIEN D. ROUSSEL,** Secretary, California Highway Commission

CONSTRUCTION of the State street project, as the new section of the Coast Highway in Los Angeles County between Redondo Beach and the east city limits of Long Beach is known, has progressed so satisfactorily that at present there are only two comparatively short sections of this highly important arterial highway which are not either completed or under contract by the State Division of Highways.

With construction started only a year and a half ago, remarkable progress is being made on one of the most complex highway problems in the entire state. Its consummation will add another great link to the already long chain of improvements on the Coast Highway (State Sign Route No. 3), extending from Oxnard on the north along a large portion of the coast line of Ventura, Los Angeles and Orange counties to San Juan Capistrano, and involving expenditure by the state of several millions of dollars.

CONGESTED AREAS BY-PASSED

The importance of this project to the motoring public can hardly be exaggerated since it will provide an arterial by-pass for through traffic around the built-up traffic congested beach areas of Wilmington and Long Beach in place of the series of narrow county roads and city streets over which traffic has been routed.

Built to meet the latest standards of alignment and grade, in general, the pavement will be 40 feet wide providing four lanes of traffic with curbs 74 to 76 feet apart, so that as traffic continues to increase the pavement can be readily widened to the full width between curbs to provide six traffic lanes and two parking strips 7 to 8 feet wide adjacent to the curbs.

The State street project fills a definite gap in the Coast Highway, connecting at Redondo Beach with a series of highway units recently completed through Redondo Beach, Manhattan Beach, Hermosa Beach, El Segundo, and entering Santa Monica via Lincoln boulevard.

With the completion of projects now under contract or shortly to be let to contract in Santa Monica and along the Los Angeles and Ventura County coast northwest of Santa Monica, the route will be adequately improved for present day traffic from Wilmington to Oxnard.

JULIEN D. ROUSSEL

CLOSES COAST GAP

At Long Beach, State street connects with the northwesterly end of the Hathaway avenue unit of the Coast Highway constructed about two years ago which extends to Seal Beach. Thus, with the completion of the State street project, a continuous, modern highway will extend along the coast from Oxnard to San Juan Capistrano.

The first contract to be awarded was from the east city limits of Los Angeles to Pacific avenue in January, 1934, a length of 1.8 miles. Following this, in rapid succession contracts were let from east city limits of Los Angeles to Alameda street (0.79 miles); from Wilmington to Redondo Beach (4.96 miles); from west city limits of Los Angeles to Wilmington boulevard (1.96 miles; from Pacific avenue to Olive avenue in Long Beach (0.50

(Continued on page 14)

STATE STREET PROJECT extending between Redondo and Long Beach involved setting back power and oil lines to increase road width particularly through the Signal Hill oil district, where the roadway was narrow as shown in top picture. Below is a section of the new highway between Wilmington and Redondo—two 10-foot strips of concrete separated by a 20-foot strip of asphaltic concrete. Bottom picture shows a completed portion in the Signal Hill area widened to provide a six-lane arterial.

Flood Problem on State Street Unit

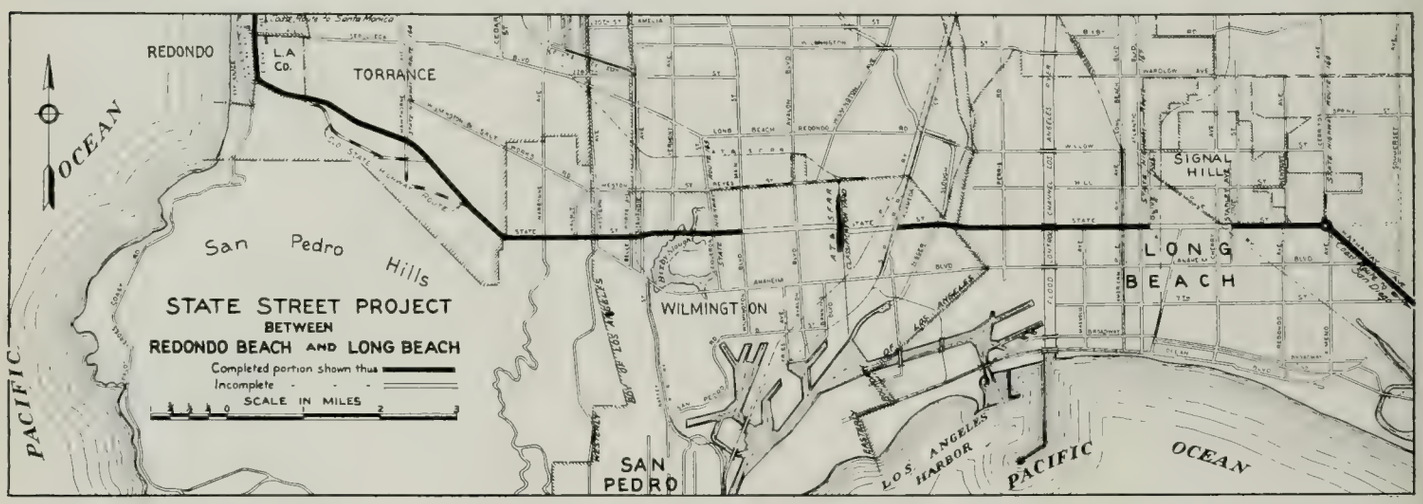
(Continued from page 12)

miles) ; and from Stanley avenue to Loma avenue in Long Beach (0.71 miles), covering a total of 11.30 miles.

Nigger Slough bridge, a vehicular tunnel and some smaller structures have been built under a separate contract.

Pavement on these contracts has been constructed 40 feet wide or more throughout with wide oiled shoulders. Curbs were placed in general throughout the projects either 74 feet or 76 feet apart so that the entire width can be used as a traveled way.

Between Redondo Beach and west city limits of Los Angeles the alignment has been greatly improved, effecting a half-mile saving in distance over the old county road which



followed streets previously dedicated to highway purposes through subdivisions. On the portion from west city limits of Los Angeles to Wilmington boulevard, the new highway crosses Bixby Slough, which involved a difficult construction problem of compacting the fill across this marshy formation and also the problem of protecting the fill slopes from erosion by the water in this slough. Embankments were protected by the planting of willow trees to check erosion by the waves.

TWO INCOMPLETED SECTIONS

Both of these contracts were completed during June and the last of the series of contracts (the section from Stanley avenue to Loma avenue in Long Beach) which has been awarded should be completed by September 1st, leaving only two uncompleted sections on the project.

From Olive avenue to Stanley avenue in Long Beach, one of the uncompleted sections, the existing street is narrow, being only 36 feet between curbs. A portion of this 1.25 mile section is subject to inundation during extremely heavy rains. The Los Angeles County Flood Control District and the city of Long Beach engineering department are now engaged in preparing plans for properly draining this portion of the city, and it is anticipated that construction of storm drains for this area will begin in the very near future.

Storm water control for this area is estimated to cost over $600,000. The State Highway Commission has voted $100,000 toward the drainage of the state highway through this low area and will cooperate with the city and the flood control district up to this amount when it is definitely determined that a plan has been worked out which will free the State highway from danger of inundation.

The widening and improvement of this section of highway in the city of Long Beach should be postponed until storm water hazards are adequately provided for.

GRADE SEPARATION NECESSARY

The other section not yet under contract is the two mile length from Wilmington boulevard to Alameda street. Difficult right of way problems as well as the necessity of constructing a grade separation across the Atchison, Topeka and Santa Fe freight classification yard have delayed this construction.

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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

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IMPORTANCE OF SEEING

The need for seeing on the highway has not been given due consideration in the past when regarding the developments and facilities for highway travel. Whether by day or night, seeing, in order to provide safety, must be done quickly and with certainty. Time intervals of less than one second duration may mean the difference between "life or death." The past decade has seen the birth of a new science—the Science of Seeing—which is now affording a new approach to highway safety. We now are able to obtain a new conception of visibility, which shows a definite need for greater factors of safety. Today, we realize that the eye is but a tool to be combined with light and lighting; that the human being as a seeing machine has certain definite limitations which, when not taken into account, materially increase the toll of traffic accidents.

In the past, the engineer has interpreted vision and visibility in the customary manner but now we realize that the word "SEEING" is the total act of recognizing objects. It involves the so-called visibility of the object and the capability and sense capacity of the human seeing machine. This yields a new conception of visibility because this must deal with more than the physical characteristics of the object and its background, such as size, color and brightness. Visibility of an object must also include the ability of the human seeing machine, which in turn involves obvious factors, such as eyes and time and less obvious ones, such as distractions, available sense, capacity, bodily, neural and mental states."—*Arnold H. Vey, New Jersey State Traffic Engineer in American Highways.*

Impressions of an Office Man After 5 Days in the Field

THE following expurgated excerpts from a letter addressed to a friend in the central office are the impressions of an office man after five days work in the field on construction:

Dear Garry:

Well, here we are, safely hidden away in the quiet little town of Madusa. Everybody is happy, sunburned and hot as hell.

Son, before you decide to go in the field ask yourself these quesions:

1. When A. C. leaves the plant at 350° F. on a day when the temperature is 105° F. in the shade, what are you going to feel like after bumping it with a five-foot straightedge until 7 p.m.?

2. When the gosh dinged weigher is pulling the batch weights short and you stand on the platform to watch the indicator with Erhlenite boiling out of the elevator in a dense fog, what does that make you? (Note to Pete: The dust mask is out on this job, you might as well show up with a pansy in your lapel.)

BUMPED BY PENCIL

Think those over and while so doing pass these words along:

Tell Ed Waite that when this district comes in with their next request for an "S" work order not to whittle it down, but remember their overhead has increased, I'm here now.

Do you suppose that you could reason with Cush to buy something besides this blasted No. 737 yellow crayon pencil that breaks every time you go to mark A. C., and bends your finger nails back on your knuckles? The street is just one chorus of yowls when the boys are marking bumps. If he wants names, places and dates I'll be only too happy to supply them.

Note to Sal: Thanks for the going away shower. I haven't gnawed the big plug yet but am bearing in mind that men who chew are men who do.

AN ECONOMY SUGGESTION

Note to Bill: Why waste tracing cloth on plans? All you need is a title sheet and a resident engineer.

Note to Cush: How about that gosh danged No. 737 yellow crayon?

To Joe: Only five days and what a different slant on specs.

To Rod: What I couldn't tell you about pay rolls!

I would like to write to everyone, but this must do for separate greetings.

I have no complaints at all exceept that damned No. 737 yellow crayon.

Panama is to spend approximately $1,000,000 on the construction of highways during 1935 and 1936.

Parent, concluding the recital of his exploits: "And that, my boy, is what I did in the Great War."

Son: "But, Daddy, why did they want so many other men besides you?"—*Montreal Star.*

State Built 100 Bridges in Biennium Contributing Over 4500 Man-years' Work

By **F. W. PANHORST,** Acting Bridge Engineer

MOTORISTS traversing modern highways comfortably settled in deep cushioned seats, controlling almost without effort the power of a hundred horses in guiding the courses of their one to two ton vehicles, give but little thought as a rule to the construction features of roadways and structures over which they pass. Attention is on their own paths—pavement lanes bounded on the left by a glistening white traffic stripe and on the right by a smooth shoulder and a blur of shrubs, fences, trees and telephone poles.

With nearly a mile of roadway to be scanned each minute, between eighty and ninety feet per second, there is naturally little opportunity for, or interest in, appraising the character or safety of the bridges and trestles on the way.

The roadway may be elevated to afford free rapid passage over busy railroad yards, or may round a shoulder of a mountain side to cross at one hundred or two hundred feet above a rocky canyon, but as long as the road is reasonably smooth and wide and the curves not too sharp, the motorist will likely have little conception of the structures on the route. A $100 or $500,000 bridge is only a flash of gray-white railing.

F. W. PANHORST

WORK OF BRAIN, BRAWN, MILLS

To perhaps one of every thousand passing by, the high curved ribs and tall columns of a concrete arch or the long slender trusses of a steel bridge signify something more than a link between solid earth on two hillsides. To the thousandth man they are perhaps somewhat of a monument to the efforts of the designers who have spent hours over drafting tables, a pencil in one hand and a slide-rule in the other; of the laborers who have spent hours clearing, mucking, blasting, picking, shovelling their way down to solid foundations; of cement mills and rock plants grinding out tons of concrete materials.

He visions steel mills thousands of miles away shaping the steel; ships loading at east coast ports and unloading at fabricating plants for the cutting, punching, fitting and riveting; long truck hauls, partly over narrow mountain roads; then highlines picking heavy girders and trusses and easing them gently into place; surefooted steel workers fitting, bolting and riveting—all before placing the concrete deck and rail which to the average traveler, if noticed at all, is the bridge.

PROGRESSIVE POLICY FOLLOWED

Economical bridge building requires a very considerable preliminary work in the way of foundation investigation, study in the matter of type selection and more work and study in the design of adequate members in order that the structures may be pleasing in appearance and practical in construction.

In so far as feasible, standards have been developed to reduce design costs and to secure uniformity in appearance. However, with new developments in materials available and improvements in fabrication continual changes are necessary to take full advantage of changing conditions. The policy of the bridge department has been one of conservative and progressive improvement rather than

(Continued on page 18)

SOME BRIDGES BUILT IN BIENNIUM—At top, 500-foot bridge with 150-foot concrete arch across west branch of Feather River on State Highway 21. Below, 2050-foot steel girder and concrete bridge across Tuolumne River on Golden State Highway near Modesto, and the Monterey Pass Overhead, a concrete rigid frame structure on State Route 26. At bottom, a 150-foot steel truss structure across the Russian River on the Redwood Highway near Preston in Sonoma County.

Bridges in Biennium Total $5,000,000

(Continued from page 16)

stagnant standardization in organization methods or design and construction practice.

During the last two years the department has designed and built about one hundred structures of various types varying from small timber bridges to large steel and concrete bridges and varying from $10,000 to nearly $1,000,000 in cost.

Accompanying pictures illustrate several types of construction. The underpass at Goshen Junction, about forty miles south of Fresno, is typical of a number of undercrossings with railroads. Mt. Vernon Avenue overhead crossing, costing about $250,000, is one of the larger structures built to carry highway traffic over railroads. A less expensive type of overhead was used for the lighter traffic on Route 20 in Redding, shown as the Eureka way overhead.

ECONOMY IN DESIGNS

The concrete arch bridge across the west branch of the Feather River was selected to fit in well with the surroundings. Likewise, the structure built to separate the grades of Monterey Pass road and the new Los Angeles-San Bernardino, Route 26, was chosen to harmonize with the locality. The latter is one of several rigid frame concrete bridges developed for economy in clearance and to provide a pleasing appearance.

Dolan Creek Bridge, a three hinged timber arch, has been described in previous articles. In this bridge, as in a number of others, toothed and split ring connectors have been used to develop the full strength of the timber and effect economy in amount of lumber required.

The south fork of the Eel River Bridge at Smith Point is typical of a number of continuous steel girder bridges. This bridge was given honorable mention by the judges in the annual contest of the American Institute of Steel Construction for the most beautiful steel bridge built during the year. The Sacramento River Bridge at Redding and the Oil Junction overhead crossing at Bakersfield are of similar design.

EXTENSIVE INSPECTION SERVICE

The M Street Bridge at the west entrance to Sacramento, also more fully described in earlier articles, is the largest single project on the bridge department program for the last two years. It is expected that traffic will be able to use the bridge in October.

In addition to new construction, an important phase of the department's work is the frequent inspection of the 3500 bridges on the state highway system. Repairs and minor improvements run upwards of a quarter million dollars every year.

The bridges mentioned and pictured are only a very few typical cases of the hundred or more built during the last two years at a total cost of about $5,000,000. With the expenditure of this money, the motorists have been provided with a number of substantial bridges over streams, the hazards have been reduced by grade separations, direct employment on the jobs has given to local labor over $1,500,000 or about 1500 man-years of work, and labor in shops and mills has benefited to the extent of 3000 man-years of work and over $3,000,000.

Autoists Seek End of Federal Gas Tax

Passed by Congress in 1932 as a temporary measure for one year only but twice extended, the Federal gasoline tax of one cent per gallon reached its latest expiration date, June 30. Nationwide efforts against any further extension of the tax are in progress, according to a statement by the Automobile Club of Southern California. The motorists' organization is urging members of the California delegation in Congress to lend their support to the movement for abolition of the tax.

That the Federal tax was intended only as a temporary measure is declared by the club to be substantiated by the fact that it was adopted reluctantly in the face of widespread opposition and for only one year, whereas all other taxes imposed under the Revenue Act were for two years. The statement also emphasizes that the Federal gasoline tax is the only universal duplicating tax in existence, all the states having imposed a gasoline tax long before the Federal government entered the field.

Diner: "I see that tips are forbidden here."
Waiter: "So was apples in Eden."

SOME STATE BRIDGES BUILT IN LAST BIENNIUM. No. 1. Prize winning Eel River bridge at Smith Point on Redwood Highway. No. 2. Dolan Creek Timber Arch structure on Carmel-San Simeon Highway. No. 3. Eureka Way overhead in Redding. No. 4. Vernon Avenue overhead in San Bernardino.

Indio Cutoff Recently Opened to Public Avoids Dangers of Box Canyon

By **W. L. McFADDEN**, Resident Engineer.

THE new highway known as the Indio Cutoff road in Riverside County was opened to public traffic last month.

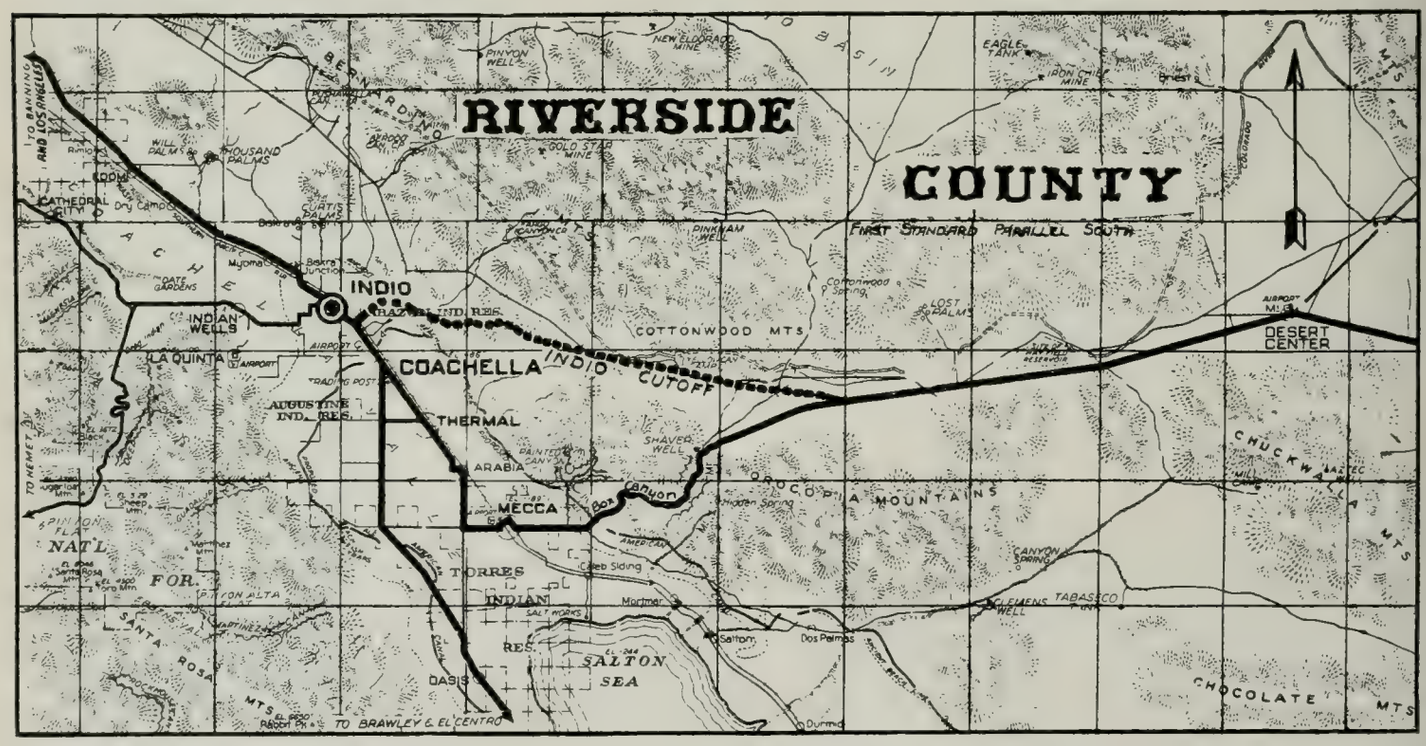
This cutoff will be used by transcontinental and interstate travel between the Colorado River near Blythe and Indio where it connects with U. S. Highway No. 99, leading thence on to the Los Angeles area.

The tourists who use the highway and the local residents will welcome the completion of the new section. The old route through Box Canyon, on which it was necessary to travel prior to the completion of the new highway, traverses a country much eroded by the action of cloudbursts and wind storms, and while the road through Box Canyon has been improved by oiling of the surface, it is still subject to cloudburst action and extremely hazardous during the season of the year in which these storms occur.

The new road is 24.3 miles in length and represents a saving of 9 miles in travel over the old route. There are 18 curves in the new routing with a minimum radius of 1600 feet. In elevation the road rises from 47 feet below sea level near Indio to 1688 feet above at the summit. The maximum grade is 6.3 per cent for a short distance only.

Drainage conditions are taken care of by the use of 15 timber bridges varying from 19 feet to 266 feet in length. The total cost of the project will amount to approximately $482,000.

The project has given employment to approximately 100 men on an average for the period of construction which has been from May 14, 1934, to June 15, 1935. The actual date for completion of this road was set for November 7, 1935, but the contractor so scheduled his work that the job has been finished five months ahead of the completion date.



NEW EQUIPMENT DEVELOPED

Work on this project has developed some new equipment for use in desert road construction.

Another state highway project to the east which connects the Indio Cutoff road with the completed highway at Shavers Summit will be finished early in the summer and will mark the completion of the whole route between Blythe and Indio to modern standards.

INDIO CUTOFF COMPLETED and opened to traffic removes U. S. 60 on State Route 64 from the storm damage and hazards of travel on old Box Canyon route. Nos. 1 and 2 show sections of the new cutoff. No. 3. Old winding road between precipitous rock walls in bottom of Box Canyon. No. 4. Example of storm damage on old route. No. 5. Truck caught and wrecked in Box Canyon flood.

New Machine Developed for Striping 7500 Miles of Highway Traffic Lanes

By **W. A. SMITH,** Assistant Maintenance Engineer

BIDS having been secured and awards made by the Bureau of Purchases for the materials required it is proposed to have the traffic striping program for the state highways under way by August 15 in order that this safety feature may be renewed for the protection and guidance of traffic particularly during the wet and foggy season.

There is, perhaps, no other single item of highway safety work which receives the favorable comment accorded the traffic stripe. Those whose business requires that they travel the highways at all hours and seasons would frequently find themselves in difficulties except for this white guide line.

From a small beginning in the fall of 1926 —when one single striping machine was sent out to cover the state-wide program—this phase of maintenance work has expanded until at the present time each of the eleven highway districts is equipped with a modern outfit and the Los Angeles and San Francisco crews are operatqing practically continuously. Some 5000 miles of the highways are now striped with a total of 7500 stripe miles.

NOT A SIMPLE MATTER

The placing of the stripe would appear to be a simple mechanical matter, but on the contrary a considerable amount of study and experiment have been required to develop satisfactory material, equipment and methods to secure a true, uniform, enduring, and economical stripe.

The cost of the lacquer is a very considerable item, and since the service to which this material is subjected is severe, it follows that a nice balance must be maintained in the formula to insure a reasonable service life at a minimum cost. The preparation of specifications for the lacquer now used was developed by the materials and research laboratory of the Division of Highways following considerable experiment and testing.

The work requires that the lacquer dry without tracking within fifteen to thirty minutes. It must give a satisfactory coverage, resist discoloration when placed on an asphaltic surface, flow readily through the spray machine, adhere strongly to the surfaces on which applied, and endure extremes of weather as well as the abrasion of traffic.

The inspection of the raw materials used, as well as all processes of manufacture, is under the supervision of a representative of the Materials and Research Engineer. During the past two years an unusually uniform and satisfactory material has been thus insured.

The first machine assigned to the work consisted of a paint tank and small compressor mounted on a small carriage. It was hand propelled. The paint tank held about eight gallons and the delays incident to mixing the lacquer and filling the machine were so great that only from three to five miles of stripe could be placed in a day.

PAINT CAPACITY INCREASED

As shown by the accompanying photographs, the new equipment as developed by the Equipment Department of the Division of Highways is a great improvement over the old. The paint tank and compressor have been removed from the spray machine proper and placed in the body of the truck tender. Ample air and paint capacity have been provided. Large wheels have been placed on the spray unit; the wheelbase lengthened; and an easily controlled pointer or guide provided to insure a true, uniform line.

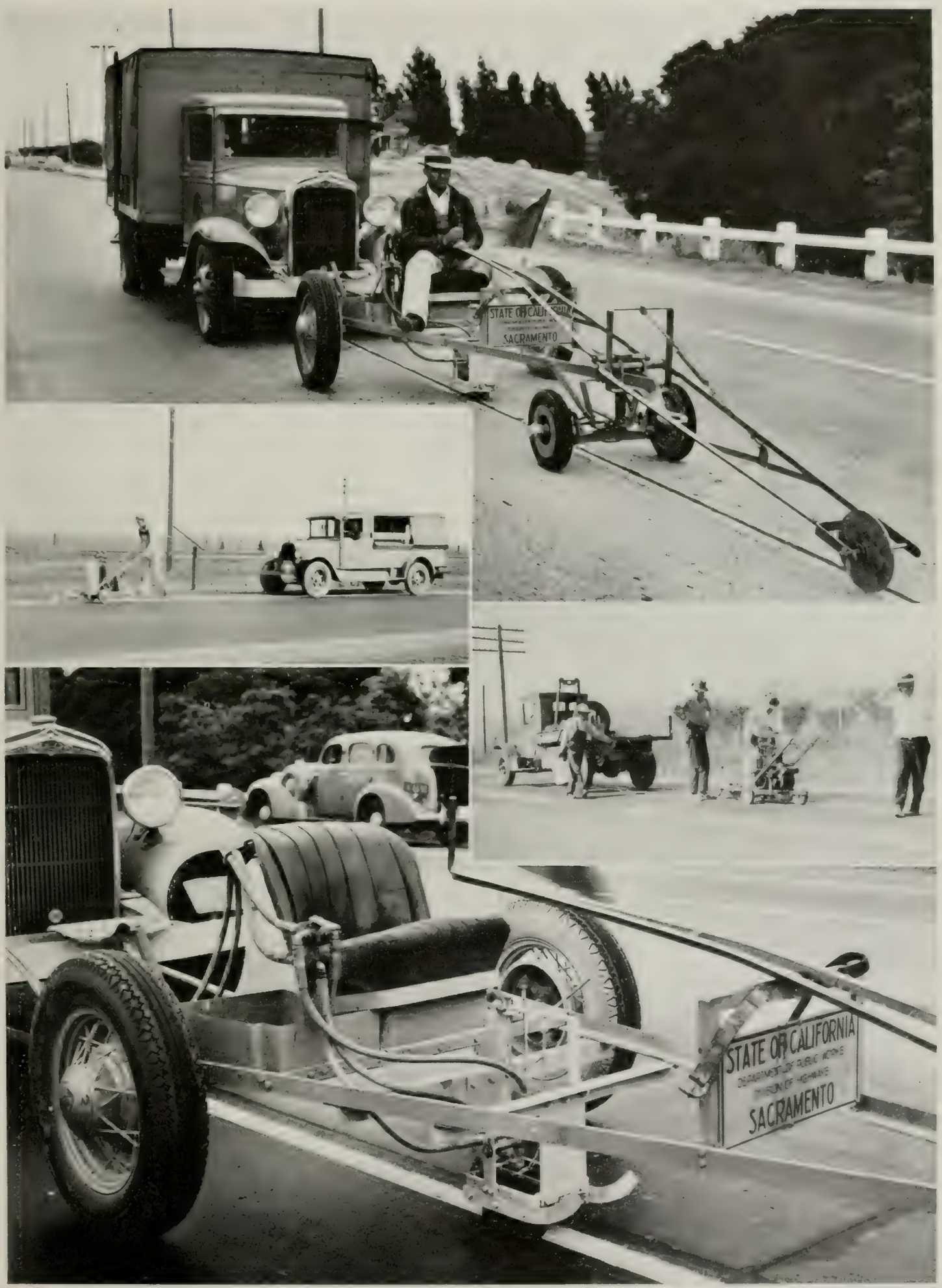
Provision is made to permit cleaning the pavement surface with compressed air in advance of striping, and in some cases a small pump is provided to salvage the excess lacquer blown against the slide plates or discs which govern the width of line.

The fresh line is protected while drying by small markers consisting of a coiled wire carrying a red flag. These markers are placed from the rear of the tender truck as the work progresses and are picked up from a light car when the line is dried sufficiently.

On sections of road not previously striped and on curves where the line has been obliterated, care is taken to spot the center line in advance of striping to insure a true, even appearing line.

A considerable mileage has been let out to contract from time to time and several contractors have developed outfits which are

(Continued on page 29)



NEW TRAFFIC STRIPING EQUIPMENT, developed by Division of Highway shops, averages 18 miles of four inch stripe per day. It is propelled by truck tender which carries lacquer paint tank and air compressor connected by pipe lines with the spray unit. Latter has easily controlled pointer and flow lever to insure uniform line. Old hand propel.ed machine, shown in the smaller pictures, had eight gallon capacity and averaged three to five miles of stripe per day.

Highway Damage by Slides and Surface Failures Caused by Abnormal Winter

By **C. F. WOODIN,** Assistant Maintenance Engineer

CALIFORNIA'S highways have experienced varying amounts of damage this past winter and spring through slides and pavement surface failures. Frost damage and abnormal rain and snow accounted in large measure for these conditions.

Mountain roads carrying heavy truck traffic suffered the greatest damage. Normally in these areas the ground is frozen before the first snowfall. During the past winter, much of the snowfall occurred before the ground was frozen, which allowed the moisture to seep into the surface and later freeze, with detrimental effect both to the base and surface of the pavement.

During the past several years, precipitation has been below normal. Roads which served traffic during these relatively dry years failed to stand up during the past winter. In the forest areas, the stimulation of logging added a heavy burden of trucking not anticipated when these roads were constructed.

LIGHT SURFACES SUFFERED

Certain types of construction suffered more than others. Light oil tops and bituminous macadam surfaces, when not water-tight, disintegrated under the frost action. The seal, once broken, permitted the infiltration of water to the base, reducing its supporting power and offering little resistance to the pounding of heavy loads.

Damage has also been caused by insufficient drainage facilities. Intermittent springs under the roadway are usually evident only in years of heavy precipitation. During the past winter, springs developed which were otherwise inactive. In several instances, oil surfaces completed in late fall did not have a sufficient period for sealing and were badly broken up through seepage and subsequent frost action.

Slides interfered with drainage, covering pipe inlets and filling gutter drains. Water thus intercepted flooded small areas and saturated the subgrade with detrimental effect to the surfacing.

Swollen rivers and streams threatened the fill slopes and in some cases forced bridges from their foundations.

All of the damage occurred to the highways throughout the State within a relatively short period and caused a heavy drain on the funds and facilities available for maintenance purposes.

Damage in the south was confined mainly to slides. Heavy cut slopes on new construction furnished the bulk of the slide material. Fill settlements on the new Ridge Route Alternate were of such magnitude as to require the placement of new surfacing material over the original pavement to restore the section to its former grade.

The Ventura-Maricopa lateral sustained heavy damage from slides. In the Sespe Gorge where the highway traverses deep cuts through thick concentric layers of shale and sandstone, heavy rains dissolved the material between the sandstone layers, precipitating great slabs of rock into the highway.

ROADWAY RELOCATED

Some 30,000 cubic yards of this material was utilized to widen the roadbed at the base of the slide, thus permitting a shifting of the roadway to a location no longer endangered by future slides.

The Roosevelt Highway along the coast north of Santa Monica likewise suffered from large slides.

Mud flows on the coast route near the Ventura-Santa Barbara County line interfered with traffic during various periods of heavy rains.

Extremely high tides and heavy ground swells deposited quantities of sand and gravel to a depth of 6 to 18 inches on the highway. As soon as the waters receded the deposited material was removed from the pavement with grading equipment.

In the north, damage was sustained through the action of frost, moisture and heavy truck traffic on weak bases. Slides also exacted their toll as well as erosion from streams both small and large.

Slides involving the movement of 15,000 to 20,000 cubic yards of material blocked the Rumsey-Lake County road.

Spring Floods Damaged River Roads

(Continued from preceding page)

On the Redwood Highway some 200,000 cubic yards were removed from a slide near San Rafael. In the vicinity of Garberville and Crescent City other large slides and roadway slipouts occurred. Skyline boulevard south of San Francisco, the coast route between Carmel and San Simeon, the Feather River road, and the Placerville road to Lake Tahoe likewise contributed generously to the burden of slide removal.

Slides were confined principally to the roads of comparatively recent construction, although some of the older highways were thus obstructed.

Spring high water washed away portions of the fill slopes and roadway at several locations.

The Sacramento-Antioch Highway along the Sacramento River has been threatened at various locations by river currents dissolving the toes of the sandy fill slopes of the levee, which the route traverses. A contract was let prior to highwater for the placing of rip-rap for bank protection. This has been completed but new washes have developed during the past spring and will require the extension of this protection work.

DAMAGE BY CLOUDBURSTS

Cow Creek near Ingot, Shasta County, washed away portions of the new grade following storms of cloudburst proportions.

Similar storms resulted in washes west of Red Bluff on the new lateral to Alton, and at Hastings Creek on the Mother Lode Highway south of Auburn.

WASHED OUT DETOUR BRIDGE over Kings River east of Centerville on State Route 41.

SLIP-OUT on the Feather River Canyon Highway on State Route 21 in Butte County.

SURFACE FAILURE on State Highway No. 83 due to frost and heavy traffic.

Roadway surfaces suffered the most serious damage, the cause of which may be charged to an extensive season of rain and snow, sometimes augmented with frost action and the pounding of heavy truck traffic which, in some cases, was not anticipated.

(Continued on page 30)

Federal Work Relief Restrictions Holding Up Construction Program

By **R. H. WILSON,** Office Engineer, Division of Highways

THE Emergency Relief Apportionment Act of 1935 which provided for the appropriation of $4,800,000,000 for the relief of unemployment throughout the nation during the coming year was approved by President Roosevelt on April 8.

Of this huge sum being supplied by the federal government for expenditure in the several states, some $200,000,000 has been apportioned for various phases of relief work in California, and of this $200,000,000 an amount totaling $15,234,290 was apportioned on June 3 for work on the roads and highways of the state, with the limitations that $7,747,928 be expended for highway construction and $7,486,362 be used in the elimination of hazards at railroad grade crossings.

FOR UNEMPLOYMENT RELIEF

The Emergency Relief Apportionment Act of 1935 was designed for unemployment relief as the primary consideration and the public works to be performed by the use of the federal funds as a secondary consideration. On this basis, the limitations which are being placed upon the use of the funds by the federal government are important factors in determining the work which can be done and in setting up a possible construction program.

The Division of Highways has been only partially informed by the federal authorities as to the regulations which will apply to the work, but those regulations of which the state has been advised as this article is written are so drastic that it is indicated an entirely new type of construction procedure must be adopted if the federal money is to be used in highway construction.

Definite rules and regulations in their entirety are expected in the near future from the U. S. Bureau of Public Roads and at that time a more definite conception of the problem may be obtained.

A DRASTIC RESTRICTION

A conception of the effect on construction practice of the regulations received to date may be gained from the fact that a maximum of $1,400 per year per man has been set as the total allowable expenditure for labor, materials, and incidentals on any project financed by these 1935 emergency relief funds.

Exhaustive studies conducted by engineers of the California Division of Highways on recent highway and bridge construction indicate that materials are such a large factor in the cost of construction, especially in the case of structures such as grade separations, that the cost per year per man is two and one-half to three times the limit set under the new federal requirements.

A further restrictive requirement is that 90 per cent of all labor employed on the work must be taken from the relief rolls of the vicinity wherein the work is performed, a condition which limits the amount of skilled labor which may be used.

Further still, and dependent upon this last requirement, projects must be selected from localities where relief labor is available.

EAGER TO START WORK

The Division of Highways is anxious to get the relief construction program for which these funds will provide, arranged and under way, and it is hoped that it may be possible to proceed with the work on the basis of federal limitations. However, the nature of highway and bridge construction is such that, of necessity, the materials which go into the work are as important as the labor and if the work is to be advanced, some provision must be made for their cost.

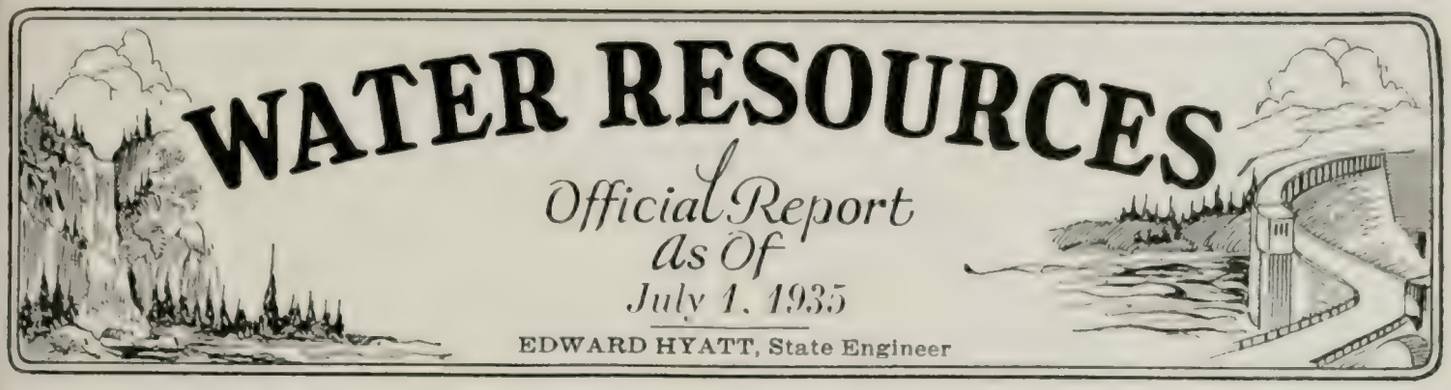
It is hoped the final regulations when received will provide methods whereby we may proceed with a program consistent with our usual practices and methods of construction.

"I turned the way I signaled," indignantly said the woman after the crash.

"I know it," sadly said the man, "that's what fooled me."

"All your fingers bound up? What have you done?"

"I bought my wife a potato peeler for her birthday, and when she said she couldn't make it work, I had to show her how simple it was."—*Fliegende Blaetter.*



Approval of refunding bonds and expenditures by various irrigation districts totaling $710,122 has been given by the Districts Securities Commission.

Scarcity of available men on relief has stopped work on relief projects in Sutter and Yuba counties till early fall.

Owing to the high summer stage of the San Joaquin River two levee breaks have occurred, one of which has flooded 4,000 acres and closed a county road.

Applications have been made for two dam construction projects at a total cost of $6,903,000.

Details of other activities of the Division of Water Resources are given in the monthly report of the State Engineer which follows:

DISTRICTS SECURITIES COMMISSION

Action on the petitions of various irrigation districts to the California Districts Securities Commission is shown in the following orders of approval issued by the commission:

El Dorado Irrigation District, El Dorado County—Validation of refunding bonds in the principal amount of $300,500.

Oakdale Irrigation District, Stanislaus County—Approval of expenditures in the amount of $15,122.31.

Santa Fe Irrigation District, San Diego County—Approval of the date of refunding bonds in the principal amount of $394,500.

Paradise Irrigation District, Butte County—Approval of filing of petition under the Federal Bankruptcy Act in connection with the plans of the district for readjusting and refunding its indebtedness.

Imperial Irrigation District, Imperial County—Confirming the plan of the district for readjustment of its indebtedness.

Corcoran Irrigation District, Kings County—Approval of agreement to purchase water.

FLOOD CONTROL AND RECLAMATION

SERA Relief Work.

No relief work is now under way in Sutter or Yuba counties, owing to the scarcity of available men on relief. This condition may continue until early fall, when it is expected that sufficient men will be available to resume work actively.

In Sacramento County one SERA crew of 25 men is engaged in clearing the timber from the right bank of the Mokelumne River near New Hope Landing, and to date approximately 5,000 man-hours has been utilized.

Sacramento Flood Control Project.

During this period inspections have been made of a number of irrigation pipe installations in the project levees, being done under approved applications to the Reclamation Board.

San Joaquin River Floods.

Commencing on April 17th, the San Joaquin River has been flowing at a medium high summer stage and some difficulty has been experienced in protecting the banks and levees on the left bank from the Banta-Carbona intake to the State highway. A small break occurred on the left bank on the El Solyo ranch near Varnalis, but this break was promptly closed by the ranch company with the assistance of relief labor.

On May 31st a break occurred in the San Joaquin River levee of River Junction Reclamation District No. 2064, near the Durham Ferry bridge. This break has inundated approximately 4,000 acres, which are still under water. It has also made the county road from Manteca to Vernalis impassable. These conditions have been examined by this office, but the Division has not undertaken protective or repair work on account of lack of funds.

DAMS

Application was filed on June 7, 1935, for construction of the Peoples Weir dam located on the Kings River near Kingsburg at the site of the present timber diversion structure by the Peoples Ditch Company. The dam will consist of a concrete floor and abutments with concrete piers and timber flashboards, 13 feet in height and storing 120 acre feet and is estimated to cost $54,000.

Application for construction of the Cajalco dam was filed on June 14, 1935, by the Metropolitan Water District of Southern California. There are two structures required to impound the water in the reservoir. The main structure is to be an earthfill 194 feet in height and the auxiliary structure will be an earthfill dam 72 feet in height. The storage in the reservoir is estimated as 100,000 acre feet, and the estimated cost of the structure is $6,849,000. This reservoir is to serve for the storage of water delivered through the aqueduct from the Colorado River.

Application for the removal of the Holmes Lower Dam No. 1 was filed on June 14, 1935. Removal of this structure is necessary to clear the site of the

(Continued on page 28)

River Stages Higher Than Last Year

(Continued from page 27)

Cajalco Dam above referred to. The estimated cost of this work is $12,000.

Work of placing the fill in the main structure at Calero Dam of the Santa Clara Valley Water Conservation District is now progressing. At the other dams of this district work of stripping foundations, excavation of cut-offs and placing of outlet conduits is under way except at Vasona where work on the fill section is practically complete.

Work of preparing camps, etc., is under way preliminary to the starting of the work of enlargement of the O'Shaughnessy dam of the City of San Francisco.

Work has been resumed on the construction of the Del Rio Woods dam in the Russian River near Healdsburg and has sufficiently progressed to permit of storage for recreation purposes for the summer.

Maintenance inspections so far made reveal that although run-off during the spring has been exceptionally heavy a surprisingly small amount of maintenance work is required to again put the dams in first class condition. This work either is already under way or will be undertaken shortly.

Due to the heavy snowfall, many of the dams at higher elevations are not yet accessible. Inspection of these structures will be made, however, as soon as the roads are open in order that any work which may be found necessary can be completed during the short period available before they again become inaccessible.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

From a flow of 40,000 second-feet in the Sacramento River at Sacramento in the latter part of May, there has been a gradual drop to 17,000 second-feet on June 17. On June 17, 1934, the corresponding flow was only 3400 second-feet. During May and June all reservoirs serving the San Joaquin Valley filled and the flow of the San Joaquin River at Vernalis reached a peak of 24,000 second-feet on May 30th. This had dropped to 18,000 second-feet on June 10th. The corresponding flow on June 10, 1934, was 700 second-feet. With this flow to the Delta the lower channels and Suisun Bay itself have remained practically free of salinity as shown by the following tests for water samples taken on June 10, 1935, at some of the sixteen stations at which the sampling is permanently maintained.

Salinity at Upper Bay and Delta Stations on June 10, 1935

Station	*Salinity in parts of chlorine per 100,000*
Point Orient	940
Bulls Head	18
O and A Ferry	2
Collinsville	1
Emmaton	1
Antioch	3
Dutch Slough	1
Rindge Pump	1
Middle River	2

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty-three applications to appropriate water were received in May; 27 were approved and one was denied. During this same period one permit was revoked and 28 passed to license.

Inspections of projects covered by permits, and other field investigations were conducted during the month in San Diego, Riverside, San Bernardino, Los Angeles, Napa, Sonoma, Lake, Humboldt, Trinity, Del Norte, Siskiyou, Modoc and Shasta counties.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Final sheets of the Seal Beach and Harvester quadrangles appeared during the month. The Seal Beach quadrangle covers an area in Orange County which was surveyed in 1932 by the U. S. Geological Survey in cooperation with this office. The final sheet is published on a scale of 1:31,680 with a contour interval of 5 feet. The Harvester quadrangle covers an area in Kings County which was surveyed in 1931 by the U. S. Geological Survey in cooperation with this office. It is published on a scale of 1:31,680 with a contour interval of 5 feet.

Field work was carried on during the month on the Paynes Creek and Burney quadrangles. These are federal projects.

WATER RESOURCES

South Coastal Basin.

Work on the South Coastal Basin investigation continued along routine lines during the month. Study is now being made of the shortage and surplus of water in the various basins.

Central Valley Project.

Final action has not been taken on the financing of the Central Valley Project by federal authorities in Washington, D. C. However, indications are that the project will receive federal approval and that an initial amount will be made available for the first year's work. The State Engineer is at present in Washington, D. C., following the matter closely, and is hopeful that a definite decision will be reached shortly regarding the financing and construction of the project.

Young Bride—I have a wonderful husband!
Divorcee—Beginner's luck!

"Dad," said John, "what is a superhuman?"

"He's one, my son," replied his Dad, "who can still think of it as a pleasure car while changing a tire in the pouring rain."

Eight State Street Project Contracts Will Total $912,000

(Continued from page 14)

At present there are six tracks in the classification yard crossing the State street location, but the railroad company considers this yard, which has direct access to the harbor district, so important and the necessity for providing for expansion of their facilities so great, that the grade separation should be designed to bridge 20 tracks.

Altogether, on the eight contracts completed or under way between Redondo Beach and Long Beach, a total of $912,000 is being spent. Construction of the balance of this section will require another $575,000 which, with the $100,000 allotment voted by the Highway Commission for storm water control, will make a grand total of $1,587,000 either already spent or to be spent on this 14.5 mile project, not including costs for rights of way which are being secured by the cities of Long Beach and Los Angeles for the portions within their respective boundaries and by the state for the portion outside the cities.

In spite of the many and serious difficulties encountered, the highest construction and location standards are being maintained throughout the project. A full 100 foot width of right of way either has been or is being secured with the exception of portions through the highly developed oil property and business property in Long Beach and Signal Hill, and even through these sections where slightly narrower right of way width was accepted, the standard width of 76 feet between curbs is being maintained.

EXCHANGE OF PERSONNEL MADE IN FOUR DISTRICTS

An exchange of personnel between four highway district offices occurred last month.

C. H. Temby, office engineer of District III of the Division of Highways at Marysville, has been transferred to Stockton, District X, where he will take up similar duties.

B. W. Booker of Stockton, who has been office engineer there, has been transferred to Marysville to take up the duties of District Construction Engineer Clarence Clemens who has been transferred to District IX at Bishop.

J. B. Hardges of District II at Redding goes to Marysville to take Temby's place.

PUBLIC WORKS DAY AUGUST 3 AT SAN DIEGO; NEW OFFICE BUILDING TO BE DEDICATED

The California Pacific International Exposition at San Diego has designated August 3d as "State Department of Public Works Day."

On that date, the new office building for District XI of the Division of Highways, which is nearing completion in San Diego, will be dedicated by Governor Frank F. Merriam. Later, ceremonies befitting the occasion will be held in the state building on the fair grounds, where Director Earl Lee Kelly of the Department of Public Works will be the speaker of the day.

The Department of Public Works has an extensive exhibit in the state building. One of the interesting displays is a working model of the San Francisco-Oakland Bay bridge. The various divisions of the Department of Public Works, Highways, Water Resources and Architecture, having attractive exhibits.

State officials, headed by Governor Merriam, will go to San Diego to participate in the highway building dedication and ceremonies at the exposition grounds, arrangements for which are in the hands of Deputy Director of Public Works Edward J. Neron.

The new Division of Highways structure is located at the corner of Harbor and Ash streets, facing the site of the proposed San Diego Civic Center.

7500 MILES OF HIGHWAY STRIPED

(Continued from page 22)

equal to the state units. In the main, however, the striping work is handled by state forces due to the intermittent character and necessity of getting it under way promptly.

Whether handled by contract or by state forces, the same standards of work are adhered to. Lacquer is applied at the rate of from 8 to 12 gallons per mile of 4-inch stripe on restriping, and from 12 to 18 gallons per mile on new work, depending on the type and condition of surface.

An experienced crew will place from 10 to 25 miles of stripe per day with an average of about 18 miles per day. The cost ranges from $25 to $30 per mile, depending on conditions as to spotting, traffic, road alignment, etc.

In general, the stripes are renewed once a year, although on certain heavily traveled roads in the Los Angeles and San Francisco areas it is necessary to restripe about every six to nine months.

"Father bought a 'Reubens' when we were in Europe."

"Really, what horsepower?"

Roads Damaged by Storms and Slides

(Continued from page 25)

SURFACE BREAK west of Donner Summit caused by thawing and heavy trucking.

2000 YARD ROCK SLIDE on State Route 138 in Ventura County.

STORM SLIDES AND MUD blocked Route 162, San Gabriel Canyon.

The armor tops between Redding and Weaverville, the coast route in Marin County, various sections along the Eel River between Dublin and Niles and from Livermore to Mission San Jose were badly damaged and the failures may be charged in all cases to excessive rainfall during the past winter.

The river road between Sacramento and Woodland was inundated during highwater to a depth of five feet for a distance of one and one-half miles at the Yolo By-pass area. When the water receded, the road was reopened to traffic and the base, very much softened, became distorted under the action of traffic, resulting in extensive damage to the surface.

Along the Truckee River near the Nevada State line, a newly constructed bituminous macadam completed late in the fall of 1934 developed numerous failures. Frost action on the water which earlier seeped through the porous top, broke up the surface and softened the base when thawing occurred.

ROAD CLOSED TO TRUCKS

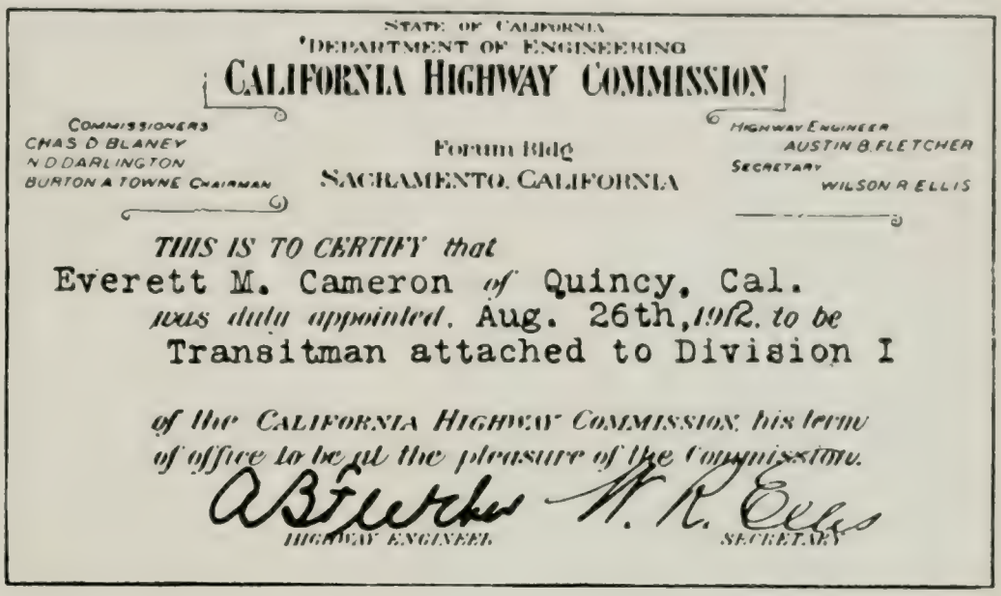
The Donner Pass road for about twelve miles west of Truckee was severely damaged by the combined action of frost, snow removal operations, poor drainage conditions, inadequate base, and heavy truck loads. The condition of the surface became so critical that it was necessary to close the road to

(Continued on page 32)

Old Timer, Do You Hold a Card to Beat This?

The first California Highway Commission was appointed late in 1911 and the first seven division engineers reported for duty January 2, 1912.

Every man appointed on the staff of a division engineer was given a card like the one at right certifying to his appointment by the commission and his rank in the service.


STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING
CALIFORNIA HIGHWAY COMMISSION
COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE CHAIRMAN
Forum Bldg
SACRAMENTO, CALIFORNIA
HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON A ELLIS

THIS IS TO CERTIFY that
Everett M. Cameron *of* Quincy, Cal.
was duly appointed. Aug. 26th, *1912. to be*
Transitman attached to Division I
of the CALIFORNIA HIGHWAY COMMISSION: his term of office to be at the pleasure of the Commission.
A B Fletcher W. A. Ellis
HIGHWAY ENGINEER SECRETARY

E. M. Cameron was appointed a transitman in Division I, August 26, 1912, twenty-three years ago. Recently the above card was found among some old District I papers and again presented to Mr. Cameron, who has risen through his ability to the position of District I Construction Engineer.

"At first," says District Engineer J. W. Vickrey, "Mr. Cameron had to walk over the job. Next a horse was furnished him and now he can cover more territory in an hour than a horse could travel in a working day."

Highway Bids and Awards for June

ALPINE COUNTY—Between Nevada State Line and 3.4 miles north of Woodfords, 2.8 miles; grade and surface. District X, Route 24, Section D. N. M. Ball-Larsen Bros., Berkeley, Sacramento, $55,752; A. Teichert & Son, Inc., Sacramento, $35,918; Isbell Const. Co., Reno, Nevada, $51,843. Contract awarded to Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland, $35,554.10.

MENDOCINO COUNTY—At Red Mountain and McCoy Creek, 0.7 miles grade and surface and 2 timber bridges. District I, Route I, Section K. Hanrahan-Wilcox Corporation, San Francisco, $196,009; Granfield, Farrar & Carlin, San Francisco, $159,371. Contract awarded to C. W. Caletti & Co., San Rafael, $148,980.

MERCED COUNTY—In Merced between southerly boundary and R Street, about one mile to be graded and paved with asphalt concrete. District X, Route 4, Section Mer. Hanrahan-Wilcox Corporation, San Francisco, $55,887; Union Paving Co., San Francisco, $45,372; Pacific States Construction Co., San Francisco, $53,170; A. J. Raisch Company, San Jose, $54,876; Stewart & Nuss, Inc., and John Jurkovich, Fresno, $48,179. Contract awarded to Valley Paving and Construction Co., Fresno, $44,036.30.

MONO COUNTY—Between 1 mile north of Bodie Road and Point Ranch, about 2.1 mile to be graded and paved with select surface material. District IX, Route 23, Section I. Gogo & Rados, Los Angeles, $42,453; Basich Brothers, Torrance, $38,325; Bayshore Construction Company, Inc., San Francisco, $54,550. Contract awarded to Kennedy Construction Co., Oakland, $36,202.

MONTEREY COUNTY—Between 33 and 38 miles south of Monterey, 2 Redwood timber bridges across Pfeiffer Canyon and Torre Canyon. District V, Route 56, Section E. F. C. Amoroso & Sons, San Francisco, $103,115; Harry J. Oser, San Francisco, $94,763; M. B. McGowan, Inc., San Francisco, $103,611; Rocca & Co., San Rafael, $106,194; R. R. Bishop, Long Beach, $106,585; Peninsula Paving Co., San Francisco, $103,930. Contract awarded to E. T. Lesure, Oakland, $92,728.

ORANGE COUNTY—Between Anaheim and Miraflores, 1.4 mile, grade and P. C. C. or A. C. pavement. District VII, Route 174, Section A. Griffiths Co., Los Angeles, $39,544; Oswald Bros., Los Angeles, $40,658; Sharp & Fellows Contracting Co., Los Angeles, $45,023. Contract awarded to C. O. Sparks, Los Angeles, $39,433.30.

SAN FRANCISCO COUNTY—Fifth Street, between Harrison and Bryant Streets, 0.1 mile, widen and P. C. C. and A. C. pave. District IV, Route 68, Section S.E. Pacific States Construction Co., San Francisco, $22,817; Union Paving Co., San Francisco, $21,591; The Fay Improvement Company, San Francisco, $22,629; A. G. Raisch, San Francisco, $22,912. Contract awarded to Chas. L. Harney, San Francisco, $20,936.13.

MONTEREY COUNTY—Between 38 and 43 miles north of San Simeon, 2 timber bridges, one across Limekiln Creek and one across Vicente Creek. District V, Route 56, Section C. Harry J. Oser, San Francisco, $97,427; Rocca & Co., San Rafael, $93,558; Alfred H. Vogt Co., Inc., San Francisco, $92,870; E. T. Lesure, Oakland, $92,043; M. B. McGowan, Inc., San Francisco, $92,256; F. C. Amorosa & Sons, San Francisco, $94,980; R. R. Bishop, Long Beach, $95,173. Contract awarded to Peninsula Paving Company, San Francisco, $88,683.75.

SIERRA COUNTY—Reinforced concrete bridge across the north fork of the north fork of Yuba River at Downieville, and road approaches graded. District III, Route 25, Section A. Lord & Bishop, Sacramento, $37,389; A. H. Siemer and John Carcano, San Anselmo, $38,364. Contract awarded to Chas. Kuppinger, Lakeport, $35,458.50.

Trailers Replacing Trucks on Highways State Survey Shows

HALF of the trucks operating on California highways are almost six years old, according to statistics compiled for Director of Public Works Earl Lee Kelly.

A similar proportion of trailers, which rapidly are supplanting trucks, are five years old. The reason that trailers are not as old as trucks is found in their growing use in recent years; for, since 1929, truck registrations have increased 31 per cent and trailer registrations 85 per cent.

A total of 288,409 motor freight vehicles was recorded last year and in a transportation survey the Division of Highways questioned the drivers of 32,400 trucks to obtain data on mileage, gasoline consumption and origin and nature of freight loads.

Freight vehicles weighing less than 3000 pounds constitute about 31 per cent of all freight vehicles. Considering only those vehicles over eight years of age, it develops that over half—52 per cent—are in the class of vehicles weighing less than 3000 pounds.

The average daily mileage produced by the old trucks is considerably less than the average of 78 miles per day for all trucks. The old group of vehicles, weighing less than 3000 pounds, averaged only 28 miles daily, and those over 3000 pounds averaged 55 miles per day.

Two questions on mileage were put to truck drivers, who were asked (a) the average miles traveled daily, and (b) the mileage on their speedometers. The average of miles traveled daily is typical of an average work day, but does not reflect the element of idle days. Since the speedometer mileage includes the results of both operation and inoperation, it was the basis used to compute total annual truck miles.

The average miles traveled daily by trucks without trailers was 78 miles, and trucks with trailers averaged 128.6 miles. In each instance the median was somewhat lower than the arithmetical average. For trucks without trailers the median mileage was 56.4; and for those with trailers, 117.3 per day. Annual mileage for all trucks averaged 9900 miles. It was noted that the annual mileage increases as the weight of the vehicle increases. Trucks of 10,000 pounds unladen weight and over make more than twice the annual mileage of trucks less than 3000 pounds.

In Memoriam

HENRY CALVIN WHITE, employed as an Equipment Operator-Laborer by District III, Division of Highways, was accidentally killed while on duty April 7, 1935, by a snowslide which buried the plow on which he was working between Bay View Rest and Eagle Falls at Lake Tahoe.

Mr. White was born at Applegate, Placer County, on April 2, 1910, and had spent his entire life in that section of the State.

Previous to working for the Division of Highways he had been employed by the Pacific Gas and Electric Company and the Pacific Telephone and Telegraph Company. He was first employed by the Division of Highways on August 27, 1934. Although only employed by the State for a few short months previous to his untimely death, "Buck" had become known among his fellow employees as a very hard, conscientious and congenial worker and his loss is felt by the entire district organization.

He is survived by four sisters: Rita, Dorothy and Josephine White of Applegate, and Mrs. L. J. Miller of Knights Landing, and six brothers: Guy, Albert, Harvey, Theodore, Francis and George, and by his mother, Mrs. Nellie White of Applegate.

STORM DAMAGE POINTS TO STAGE CONSTRUCTION POLICY

(Continued from page 30)

trucks until the spring storms abated and permitted the road to dry out.

The Red Bluff-Susanville lateral between Child's Meadow and Fredonia Pass, and the Alturas lateral in the vicinity of Adin, were similarly affected.

These experiences have not been without benefit. They point to the necessity of stage construction, building roads from the foundation. Under such a plan, carefully selected base of a desirable thickness should be laid so as to extend to the gutter or fill slopes, with gutters, underdrains and culverts at proper locations to adequately drain all water away from the subgrade.

The surface should be inexpensive, so that the failures which may occur can be repaired and reinforced at a nominal expense. Then, when it has been determined that the base is sufficiently stabilized, consideration may be given to the next stage—a surface which need not be excessively costly, but may be expected to give long and satisfactory service.

It tells a good deal about a man's home life if he orders rice pudding and home-made cake at a lunch counter.

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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FRANK A. TETLEY, Riverside
RAY INGELS, Ukiah
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JULIEN D. ROUSSEL, Secretary

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

J. W. VICKREY, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego
General Headquarters, Public Works Building, Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

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J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights
A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
GORDON ZANDER, Adjudication, Water Distribution

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P. T. POAGE, Assistant Chief
W. K. DANIELS, Administrative Assistant

HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Draftsman
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
CLARENCE W. MORRIS, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent
ROBERT E. REED, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

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Official Journal of the Department of Public Works

AUGUST • 1935

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State Getting Highway Program Under Way With $15,234,290 Federal Funds

Division of Highways Adjusting Projects for Employment of Relief Labor With New Man-hour and Compensation Conditions in U. S. Grants of $7,747,928 for Roads and $7,476,362 for Grade Separations

By **C. H. PURCELL**, State Highway Engineer

THE Division of Highways is now engaged in the solution of a number of unprecedented labor and financial problems in connection with enabling California to apply to highway and grade separation construction the $15,234,290 allotted to this state by the Emergency Relief Apportionment Act of 1935.

Under this act, making an appropriation of $4,800,000,000 for the relief of unemployment throughout the United States, an apportionment has been made to California, at this time, of $7,747,928 for road work, and $7,476,362 for grade separations.

Although the act was signed by President Roosevelt on April 8th, considerable delay was experienced at Washington in formulating the rules and regulations by which the huge sum appropriated might be administered.

C. H. PURCELL

These regulations were not brought into workable form until approximately the first of July and were presented and explained to the highway commissioners and state highway engineers of the eleven western states at a meeting in San Francisco on July 16th by A. E. Toms, personal representative of Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads.

While these regulations in many instances are the same as the regulations under which the states have been working in administering former apportionments of Federal moneys, there are, however, several additional requirements which seem to make them less workable and less adaptable to actual highway construction practices than those embodied in the former regulations under previous appropriations.

There are two distinct sets of these rules and regulations: one for administering the moneys apportioned to highways and the other, an entirely separate set, for administering moneys apportioned to railroad grade separation.

In most cases the changes made in the rules governing the new highway apportionment have distinctly added to the difficulty of getting a highway program under way. A few of the most drastic changes are as follows:

1. A section provides that 25 per cent of the money allocated for highways in the State of California shall be applied to secondary or feeder road projects, which must be located outside of municipalities and metropolitan areas and can not be a part of either the State highway system as permitted under former Federal highway apportionments, or of the Federal highway system.

(Continued on page 6)

AUG 27 1935

Deadman's Curve in Grapevine Canyon Abolished By New Ridge Route Unit

By **R. M. GILLIS,** District Engineer

WITHOUT ceremony the last one and one-half mile section of a unit of the Ridge Route relocation in Grapevine Canyon in Kern County, which involved a heavy grading contract was completed and opened to the public on July 22d, finally abolishing the dangerous Deadman's Curve, scene of many accidents on the narrow old road.

The entire unit, now completed at a total cost of over $900,000, extends from Fort Tejon to Grapevine Station and gives a continuous 30-foot pavement for a distance of 5.2 miles. It supersedes the worst portions of the old 20-foot Grapevine Canyon Highway, shortens the length of the road by approximately eight-tenths of a mile and eliminates 2937 degrees of curvature or the equivalent of eight complete circles.

MANY CURVES ELIMINATED

The extent of the improvement that results from the work just completed is shown by the following comparison of the old and new lines between Fort Tejon and Grapevine Station, where the old road was one continuous series of curves in a distance of 6.4 miles.

	Old road	New road
Maximum grade	6.3%	6%
Total curvature in degrees	3396	459
Minimum radius of curvature	80 feet	1000 feet
Length in miles	6.04	5.22

ANOTHER 5-MILE LINK

Five miles more of the Grapevine Canyon section of this improvement remain to be built, extending between Fort Tejon and the Los Angeles County line but it contains no "Deadman's Curve." This new project will complete the three-lane highway from the end of the section just finished, past Lebec to join the Ridge Route alternate and when finished will provide a continuous 30-foot pavement from the city of Los Angeles to the San Joaquin Valley.

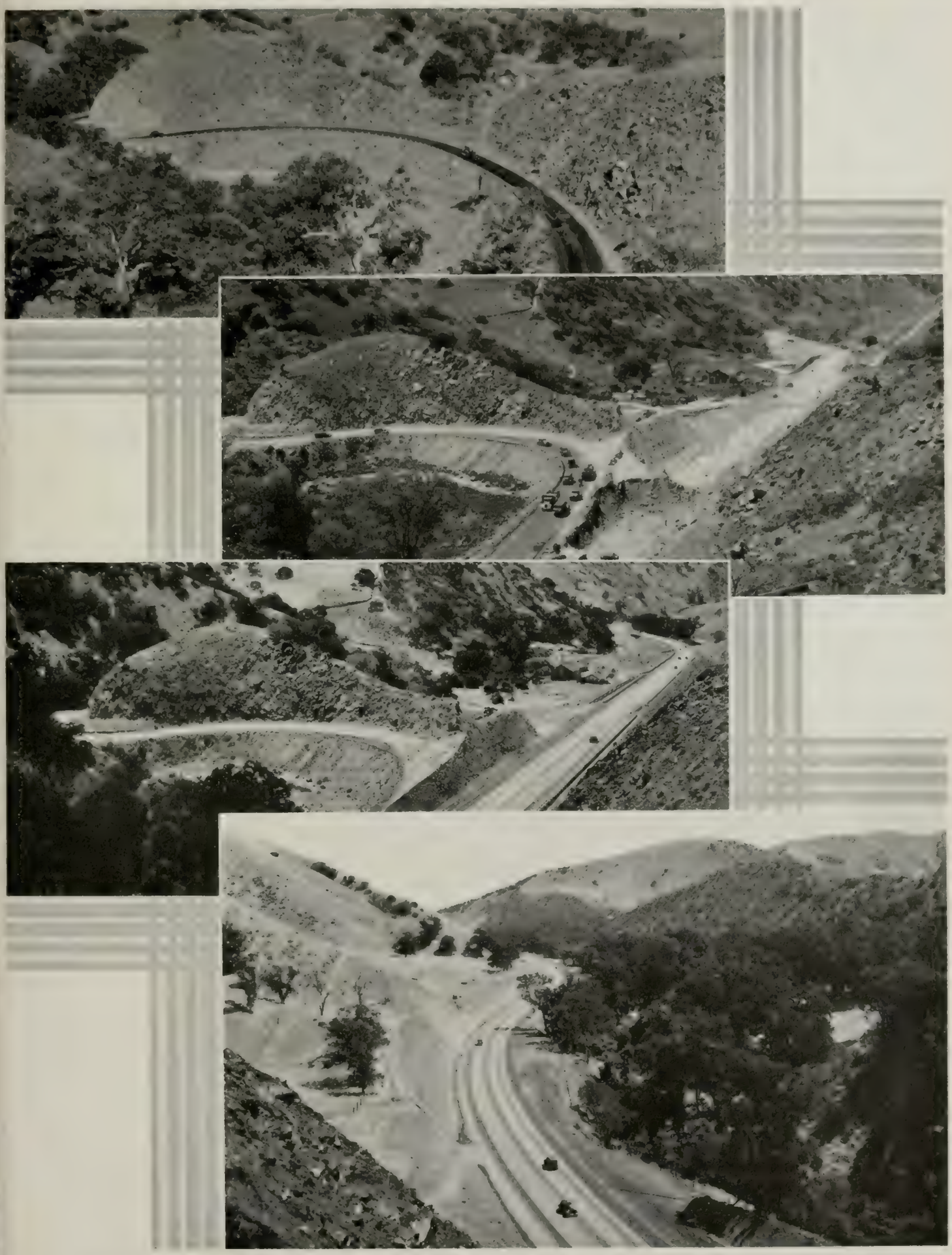
Plans are now being completed for this third and final unit of the Ridge Route relocation and the contract will probably be let this fall by the Division of Highways for the last five miles of this improvement to the great Los Angeles-Sacramento arterial.

ARROW SHOWS Deadman's Curve on old Grapevine Road. Black line indicates new highway

LEGISLATION SEEKS UNIFORM TRAFFIC LAWS, ADDED SAFETY

Legislation introduced in Congress to provide for means of increasing safety on highways would authorize the U. S. Bureau of Public Roads to make a study of traffic conditions and measures for their improvement. This study would be made in cooperation with state, District of Columbia and municipal authorities, and with other agencies.

Under the bill, a report would be submitted to Congress, within three months of the measure's enactment, on results of the study and research and on the status of uniform motor vehicle traffic laws throughout the country. The Secretary of Agriculture, who would submit the report, would transmit with it recommendations, including suggestions for legislation which "will promote the necessary uniformity" in motor traffic laws.



DEADMAN'S CURVE ELIMINATED—At top a picture of the dangerous curve in Grapevine Canyon on the Ridge Route and the narrow old road, a combination that produced many accidents at that point. Beneath, the same scene at the start of construction improvement showing the heavy grading work under way on the relocation project. The next lower picture affords a comparison of the old road and the new wide highway showing Deadman's Curve entirely cut off from traffic use. At bottom, a view of another part of the new, three-lane unit recently completed through this heavily traveled arterial.

Grade Separation Built by State on Route 4 in City of Bakersfield

By **PAUL DUNCKHORST,** Assistant Bridge Construction Engineer

ANOTHER important grade separation structure has just been completed by the California Department of Public Works through the Division of Highways. In the city of Bakersfield, on Union avenue at 15th street, an old structure passing local and state highway traffic under the tracks of the Atchison, Topeka and Santa Fe Railway has been replaced with a modern subway.

This grade separation, known as the Union avenue subway, separates State Highway Route 4, which is the main trunk highway from Los Angeles to Sacramento, from the main line of the Santa Fe railroad to Los Angeles.

DENSE TRAFFIC AREA

The structure is located in an area of very heavy motor vehicle travel both of truck and passenger car traffic, the count taken in the recently completed State Transportation Survey showing a total traffic flow of from 5000 to 7000 motor vehicles per day at that point with a daily average of 2000 to 5000 trucks.

In addition to the traffic from the Los Angeles metropolitan area on State Route No. 4 via the Ridge Alternate from the south and the Golden State Highway through the heart of the San Joaquin Valley from the north, three other important state highways contribute their quota: Route 57 from the coast at Santa Maria tapping the Maricopa oil field on the west and connecting with Owens Valley on the east; Route 140 from the Taft district on the west and the Tehachapi and Mojave areas on the east, and Route 58 from Santa Margarita on the coast via McKittrick oil fields on the west and bringing transcontinental travel from the east over U. S. 66 via Needles.

AMPLE DETOUR MAINTAINED

To care for the volume of through traffic and several local street intersections at either end of the project it was necessary to maintain an ample detour during most of the construction period.

The old subway was built by the railway company and the city of Bakersfield. It provided a 24-foot roadway and a 5-foot sidewalk on each side. The inclined approaches had unprotected earth side slopes with a 24-foot surfacing on the roadway.

With the improvement and widening of Union avenue at the south entrance to Bakersfield and the construction of five miles of new highway with wide bridges and grade separations leading out of Bakersfield to the north, the 24-foot Union avenue subway, with its steep approach grades, was the only remaining constriction on the route of this main valley highway through the city.

PROVIDES WIDE ROADWAY

The new subway has a 45-foot clear roadway with a 5-foot sidewalk on each side. In the subway proper the sidewalks pass through the abutments, as shown in the accompanying photographs.

The steel plate girder superstructure supports a double track railroad. The roadway slopes are protected with a concrete slope pavement.

The project also included improvement of entrances to property in the reconstruction of curbs and sidewalks. Improvement extends in both directions from Union avenue, along Butte street about 125 feet, and about 200 feet along Truxton avenue.

One of the main features of the improvement is the installation of the drainage system. A sump house with two sump pumps having a combined capacity of 2000 gallons per minute is to keep the subway free from standing water during heavy rains.

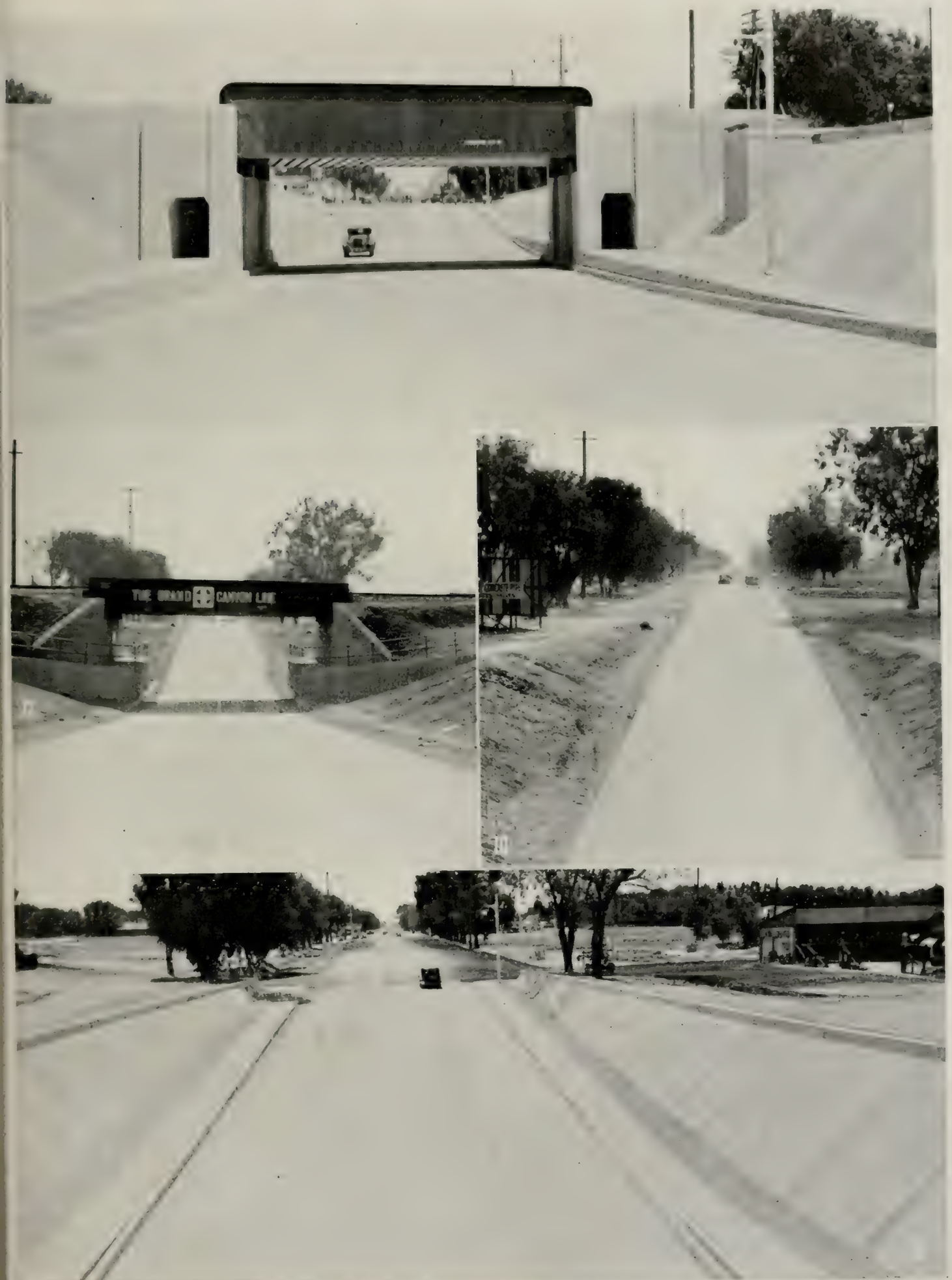
STORM SEWER CONNECTION

A 24-inch concrete pipe storm sewer, 1600 feet long, carries drainage from the north end of the project around the east abutment of the subway and connects with a new city storm sewer south of the subway.

The project was financed from the State gasoline tax at a total cost of $82,800 and has provided work for as many as 120 men at a time during the past nine months.

Wayne J. Deady was resident engineer in immediate charge of construction.

"I'll have to double my fee for psychoanalyzing you."
"Why so?"
"You have a dual personality."



GRADE SEPARATION recently completed at Union Avenue on the Ridge Route in the city of Bakersfield with State gasoline tax funds. At top is shown the heavy girder span carrying four railroad tracks, the four lane subway with pedestrian walks and concrete slopes. Center pictures show the old structure and narrow road compared with the new wide approach and highway shown below.

New Classification of Feeder Roads

(Continued from page 1)

Formerly there was a 25 per cent apportionment to feeder roads, but the only provision carried in those regulations was that the feeder roads were not to be on the Federal system. There were many roads on the State system not included in the Federal system, which could be improved under the provision.

The added paragraph in the new regulations that the feeder roads must be ones not embraced in the State highway system, makes a more complicated situation as the State officials must now secure cooperation of the county authorities as to the location of projects.

2. The allotment for a man-year, referred to in the following section, is hardly sufficient to complete most of the proposed improvements. It becomes necessary therefore, that the counties contribute a certain percentage of money to be added to this Federal allocation in order to proceed with construction, as under existing statutes State funds can not be used for so-called feeder road construction.

LOW MAN-YEAR BASIS

3. Another section provides that the Federal government's participation in any project will be limited to $1,400 for each man-year of labor used on the work, which means that the cost of the man-year of labor must be deducted from the $1,400 and the balance is available for engineering, materials, supplies, equipment and necessary incidentals.

As the average cost of all projects in the state, figured on a man-year basis and including materials, transportation, machinery, operation, etc., has amounted to approximately $3,000 a man-year for the past two appropriations, it is readily seen that for the accomplishment of a program under the new regulations, either the county or the state must supply additional funds to make up the difference between $1,400 and $3,000 or more, in order to carry on work of the same nature we have constructed the last two years, or the standards must be lowered to fit the money available.

The necessary funds to complete a legitimate project which must be added to the $1,400 per man per year, will, therefore, have to be contributed by the various counties on feeder road projects or by the State on roads in the State highway system.

4. The regulations require that the administration and the expenditure of the funds, as well as control of the work shall be entirely within the jurisdiction of the State Highway Department, in cooperation with the Bureau of Public Roads.

GRADE CROSSING ELIMINATION

5. Under previous regulations, except for supervisory employees of the contractor, all labor necessarily came through the various Federal employment offices located throughout the state. Under the new provisions a radical change is made, requiring that 90 per cent of the labor must come from the relief roll, which allows the contractor only 10 per cent to choose from his own organization or from whatever source he sees fit.

Under the railroad grade crossing elimination section of the apportionment, the regulations provide that projects must be selected under the four classifications as follows: (a) separation of grades at crossings; (b) protection of grade crossings; (c) reconstruction of existing railroad grade crossing structures; (d) the relocation of highways to eliminate grade crossings.

An added feature not heretofore included for projects of this character is that the roadway 1500 feet each side of the grade crossing measured along the center line may be included in the cost of a grade separation and further that the funds apportioned under this act shall only be available for the elimination and separation of grades at railroad crossings on existing routes and will not be available for any grade crossing, separation or elimination on a newly established highway route.

ALTERNATE PROCEDURE PERMITTED

The $1,400 per man-year clause, as applied to highway construction, also applies to grade separation projects. An alternate procedure is permitted which provides that 40 per cent of the total cost of the project, including engineering, shall go to persons directly employed on the project.

State Permitted to Underwrite Man-hour Monetary Program

(Continued from preceding page)

There is, however, another alternate plan of procedure which is allowable both under the highway program and the grade crossing elimination program. This plan embodies the execution of an agreement by the State whereby it agrees to underwrite the man-hours of labor employed on whatever monetary program is selected.

In other words, the monetary value of the program as submitted to the government, whether it be for 25 per cent, 50 per cent or for the total allocation, may be underwritten by the state to the extent of dividing the total amount of works progress administration money programmed by 90¢, which represents the amount of man-hours of labor from relief rolls that the State agrees to use on its various activities, either in the construction or maintenance program.

If such a plan is chosen, the State may then proceed on whatever basis it sees fit as to the percentage of labor to come off the relief roll for a particular project. The State, however, or the county or city in the case of feeder roads or city projects, must supplement the Federal funds by the necessary amount to complete the improvement.

COUNTIES BEING CONSULTED

The district engineers of the State Division of Highways have accordingly been instructed to immediately contact the county authorities in their respective districts with the idea of selecting feeder road projects located near centers of relief needs in each county and for which the funds available might be supplemented by the county, so that a completed improvement, adequately surfaced for the needs of the local traffic, might be undertaken.

This work would be under the supervision of the Division of Highways, which department will handle all preliminary details and supervision of construction on the various projects, the county's part being to supplement Federal participation by contributing necessary funds to the cost of the work.

Considerable preliminary work is thus involved in preparing the emergency relief program, but it is expected that these problems may be solved in the near future so that projects may be submitted to the Bureau of Public Roads and work started.

Water Conservation Report Issued for Years 1933 and 1934

THE Division of Water Resources has issued a report covering the work of the Sacramento-San Joaquin Water Supervisor for the years 1933 and 1934.

This work is a measure of relief in the difficulties attendant upon water supply conditions and use of water throughout the Sacramento-San Joaquin territory, particularly on the Sacramento River and in the Delta region. The situation involves the major problem of satisfying the water requirements for irrigation in both up-river areas and the Delta, for the control of salinity in the Delta and Upper Bay areas, and for navigation above Sacramento as demanded by the U. S. War Department.

In nearly every season of the last eleven years, each one of these requirements has exceeded the available summer flow in the rivers and the situation has been met through a provisional administration of stream flow and diversions by the Sacramento-San Joaquin Water Supervisor.

CONSERVATION EFFECTED

In years of extreme water shortage such as 1924, 1926, 1931 and 1934 the water supervisor, working in cooperation with the permanent committee of the Sacramento-San Joaquin Water Problems Conference, has been able to effect conservation measures and regulations which have been highly sucessful in tiding over the critical situations of these severe seasons.

During the past biennium the investigational work has, due to financial limitations, continued under a considerably reduced program, but along lines similar to those of previous years.

Measurements and records of diversions from the Sacramento, Feather, Yuba, American, Merced, Tuolumne, Stanislaus and San Joaquin rivers were made on the valley floor and above the Delta; return flow to the Sacramento and San Joaquin rivers was recorded, and the advance and retreat of salinity in the Delta channels and upper bays was observed and published. In the last two seasons, however, it has been necessary to omit the census of irrigated crops and water consuming areas in the Delta, as conducted in previous years.

Bay Bridge Center Anchorage Makes Largest "Pin-hole" Camera in World

ODDITIES of the great San Francisco-Oakland Bay Bridge which test the lay imagination vie with the structure's unusual engineering features and its illumined beauty by night in attracting attention to this marvelous construction undertaking.

Perhaps the strangest of these is the existence of a mammoth "box camera," creation of which was entirely unforeseen by the bridge engineers, in the huge concrete hollow of the central anchorage which "takes" a photograph 50 feet high.

"The world's largest camera," as the Anchorage Block now is called, was discovered by Chief Engineer C. H. Purcell.

INVERTED MOVING PICTURES

Descending the stairs in the anchorage, he observed in bright orange an inverted image of one of the bridge towers on the center wall of the anchorage. He was further amazed to see a ferry boat passing upside down across the wall.

Investigation disclosed that four rectangular apertures, each one by two feet in size, two on each side of the anchorage, constituted the "pin holes" or openings corresponding to the lens of a camera.

The plate upon which the images are thrown is the concrete diaphragm running vertically through the middle of the anchorage thus making the latter a combination of four pin-hole cameras set in a box 235 feet high, 197 feet long and 92 feet wide. The apertures are in walls which are about six feet thick and 207 feet above the waters of San Francisco bay.

"PIN-HOLE" CAMERAS

The images, as is the case in all pin-hole cameras, are thrown upside down on the concrete diaphragm in the center of the anchorage. The images are made by the slanting light rays. Those striking the top of the tower continue down to the "pin hole" and through to a point 50 feet below the level of the opening. The light rays that strike, or are reflected from the base of the tower, travel in an ascending slant through the "pin hole" and on to a point above the hole on the opposite wall.

When the sun is shining on the east face of Tower W-3, west of the anchorage camera, a color photo of the tower upside down is visible on the "plate." When the sun is in the west Tower W-3 is photographed in black and white. Similarly, when the sun is in the west, shining on the west face of Tower W-5, east of the camera, the image is in color, and when the sun is to the east of Tower W-5, it is reproduced in black and white on the wall inside the anchorage. The camera photographs passing ships clearly.

Another odd feature causes observant persons on ferryboats passing the East Bay section of the huge bridge to wonder at what appear to be wide cracks in several of the massive tower legs supporting the structure. Close inspection shows that the cracks go through the entire bridge, including the lower and top decks.

SPLIT TOWERS EXPLAINED

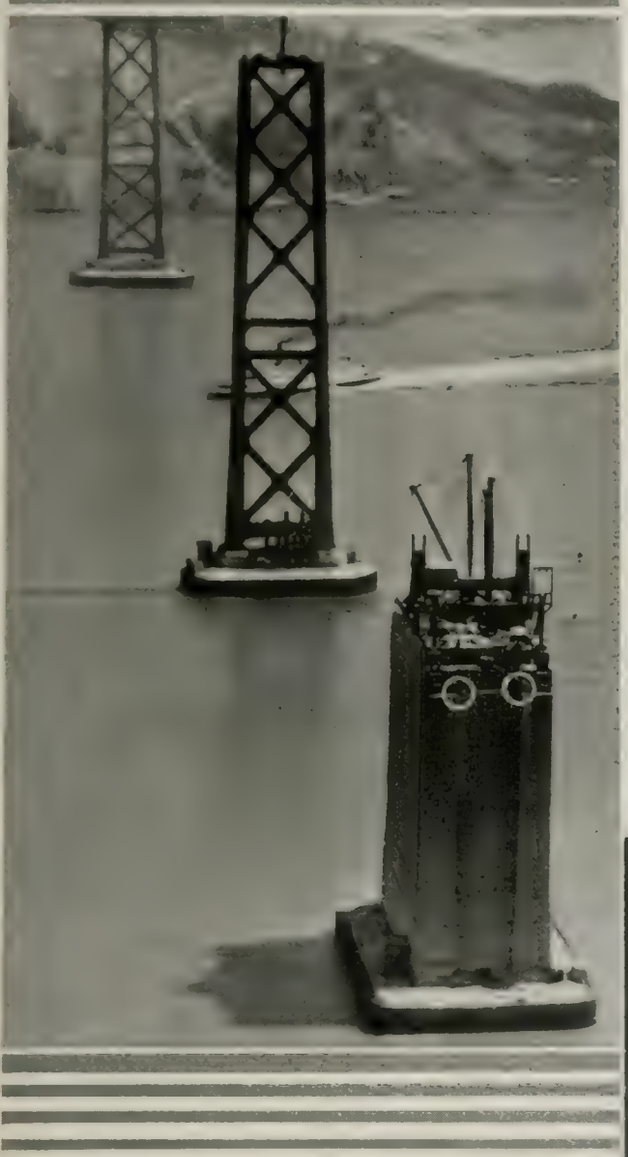
These are expansion joints designed by Chief Engineer Purcell and his staff to permit the bridge spans to lengthen and contract under the influence of heat, cold and load. The split towers make it possible for the spans to be pulled apart nine inches at this point when the spans contract.

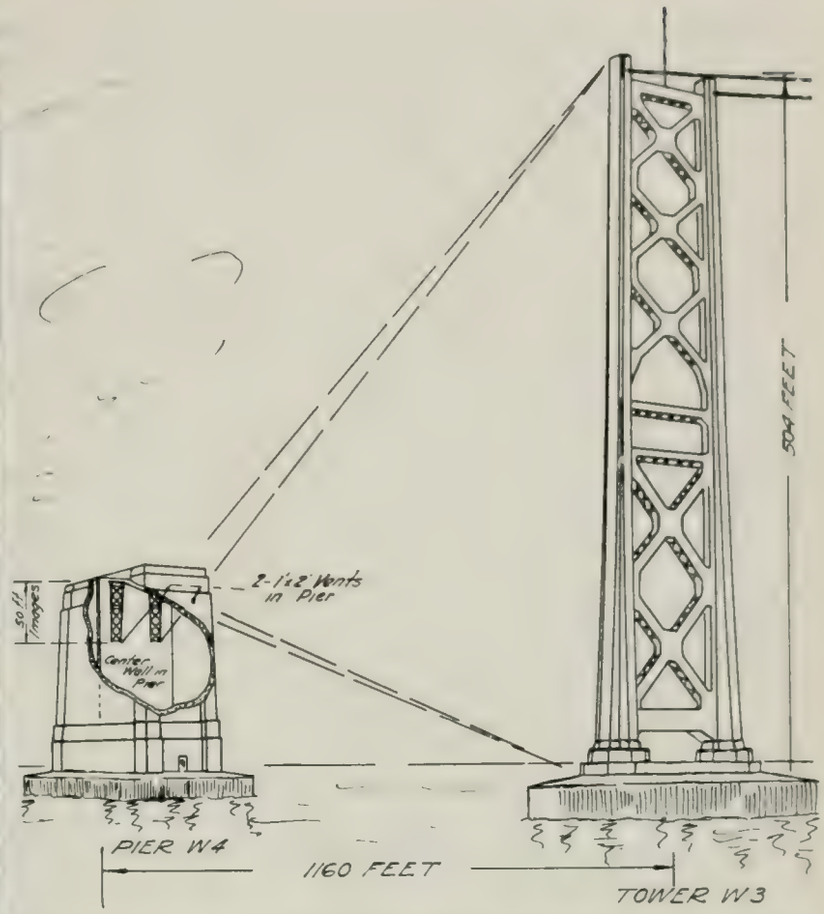
The spans are anchored securely to piers several span lengths away and all of the foreshortening, or change in length of the spans, is taken care of by flexing the two parts of this split tower. In the accompanying photograph it will be noted that even the diagonal bracings between the legs of the towers are also in separate units.

Reminiscent to San Franciscans of the beautiful lighting effects of the Panama Pacific International Exposition of 1915 is the night illumination of the bay bridge. Two long ribbons of light are suspended along the catwalks of the structure, high above the bay waters, to aid night workers in the perilous task of "spinning" the 70,000 miles of steel cable wire which will support the bridge.

Ferryboat commuters and visitors entering San Francisco Bay are afforded an unforgettable sight after dark when the bridge illumination is turned on.

(Continued on page 29)





A FREAK OF BUILDING CONSTRUCTION has produced the world's largest pinhole box camera in the huge Central Anchorage of the San Francisco-Oakland Bay Bridge which makes a picture 50 feet high on the great central diaphragm wall in the interior of a "box" 235 feet high, 197 feet long and 92 feet wide. The pictures are due to 1 x 2 foot apertures in the top of the anchorage walls through which images of passing boats and bridge towers are reflected on the great concrete "plate" upside down as shown in the above diagram.

At lower right is shown one of the steel piers of the East Bay truss span structure which seems to be entirely split by a great "crack" that causes the layman to wonder. The "crack" is an expansion joint that permits the spans to be pulled apart 9 inches by heat expansion.

Charles D. Hamilton Takes Office as California Highway Commissioner

CHARLES D. HAMILTON of Banning, Riverside County, president of the California Almond Growers Exchange and former chairman of the Riverside County board of supervisors, was appointed a member of the California Highway Commission by Governor Frank F. Merriam on July 24th, to succeed Commissioner Frank A. Tetley, who had resigned.

The new commissioner, who took office August 1st, is well known throughout the state as a successful business man, and one who is also familiar with highway problems through years of service as county supervisor and road commissioner.

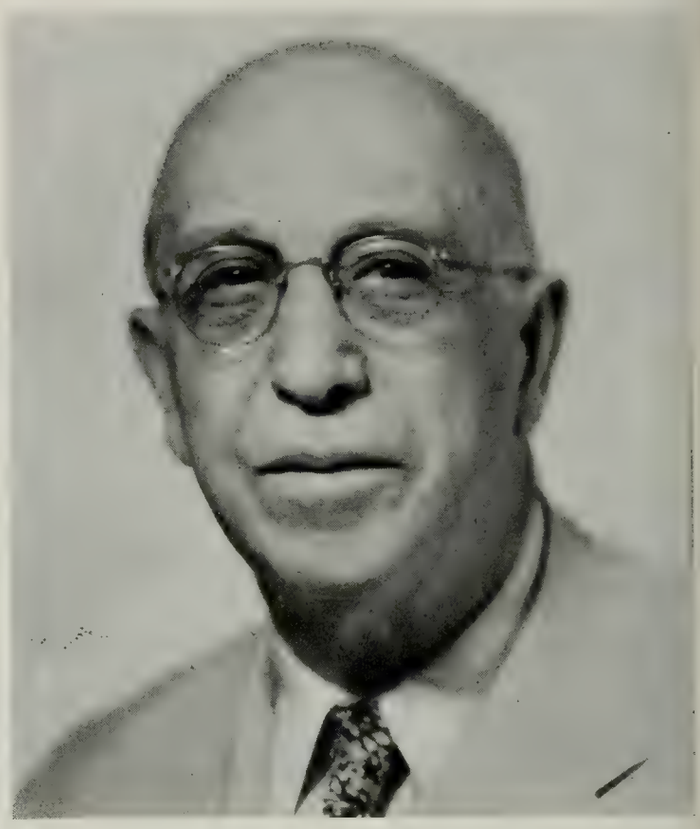
During a long and varied career Mr. Hamilton has filled a number of public offices of trust and responsibility but is probably most widely known as an agriculturist and almond grower.

Coming to California in 1885, Mr. Hamilton took up his residence in Banning, then in San Bernardino County, and in 1892 was elected county clerk. During his term of office Riverside County was formed and Banning was taken into the new county.

Mr. Hamilton engaged in farming for many years quite extensively, farming one tract of 1700 acres continuously for 20 years. In 1894 he became interested in almond culture and has continued in this industry ever since. When the almond growers of California organized, he immediately affiliated with them and for ten years has been president of the California Almond Growers Exchange, one of the outstanding cooperative associations of the state. Taking an active interest in farming and marketing problems, he has held many responsible positions in carrying out agricultural programs.

He was elected supervisor from the fourth district of Riverside County in 1914, serving three terms on that board, the last five years as chairman, when he resigned and spent a year in travel abroad.

During his term as supervisor and chairman of the board he directed a broad program of highway development throughout his jurisdiction that gave him a special knowledge and experience which will prove valuable to the state in his new office.



CHARLES D. HAMILTON

Since resigning from the board of supervisors he has held no public office until his appointment to the California Highway Commission.

Ingels Made Director of Motor Vehicles

Governor Frank F. Merriam has appointed R. Ray Ingels, highway commissioner and former State Senator, to the directorship of the Department of Motor Vehicles.

Entering upon his new duties on August 1st, Director Ingels said:

"Governor Merriam has expressed to me on several occasions his deep concern over the frightful number of motor vehicle accidents in California and his desire that I take all possible steps to reduce them. I shall devote my administration to an attempt to make traffic on the highways safer and to provide efficient registration service to the public."

Flowers Planted By Road Foremen Win Popular Acclaim

IN ADDITION to major planting projects of trees, shrubs and flowering growths under the supervision of the State arboriculturist much interest is frequently taken by highway foremen of the various districts in raising flowers about their station buildings and in likely places along the roadsides they cover in the course of their work.

Seeds are furnished for this purpose by the State Maintenance Department and the results achieved often attract favorable comment as evidenced by the following letter from Supervisor Hastings of San Diego County:

COUNTY OF SAN DIEGO
Board of Supervisors

June 24, 1935

Mr. E. E. Wallace
District Engineer
Division of Highways.

Dear Friend:

On a recent trip to Imperial Valley I noticed, particularly at your road stations at Guatay and Boulevard, that blooming profusely were California poppies. Also I noticed a number of patches along the highway. This gesture I believe is well worth while.

Along the highway that has been cleared back for a number of feet through the heavy brush, I noticed a heavy growth of California wild flowers which had an opportunity to blossom only when the heavy cover was removed.

I am sure this beautiful sight is enjoyed by everyone who travels Route No. 12, from San Diego to Imperial Valley, and especially our visitors. Such beautification is a credit to our county and our State, and I only wish that more of it could be done, as the impression it leaves upon our visitors is a very gratifying one.

Very truly yours,

EDGAR F. HASTINGS,
Supervisor.

The plants referred to by Supervisor Hastings were started by Foremen M. A. Fowler and C. H. Peck when they were stationed at Boulevard, according to District Engineer Wallace and the work has been continued by Foremen F. E. Hansen and R. W. Sorin.

Most of the seeds were raised at the Boulevard maintenance station and have been planted at various locations within the right of way extending to El Cajon.

All of the plantings have grown well and have spread considerably each year from the natural seed. The effect this year has been very noticeable and has attracted much attention.

DUTCH VISITOR LAUDS BEAUTIFUL SCENES VIEWED FROM SKYLINE BOULEVARD

August 1, 1935.

The Chief Engineer,
Highway Department,
Sacramento, California.

Dear Sir:

Having nearly completed my study-trip of American Industrial Life, which took me from the Atlantic to the Pacific, over 23,000 miles of roads, I feel urged to tell you that the impressions I received while traveling over the Skyline Boulevard in California are among the most beautiful ones I have experienced in this country.

My journey from San Diego to Washington took me over that road twice, and the simultaneous view of the Pacific Ocean and Bay district will always be remembered by me as one of my most thrilling sensations.

With best wishes.

Very truly yours,

(Signed) JAN TEDERS.

Editor's Note.—Mr. Teders is an executive of the Association of Directors of Electrical Industries of the Netherlands, with headquarters at Amsterdam, Holland.

TOTAL HIGHWAY AND STREET MILEAGE IN STATE IS 95,957

California has 95,957 miles of roads and streets administered respectively by the State, county and municipal governments. Rural road mileage, which includes roads in the State highway and county systems, increased from 45,069 miles in 1909 to 61,039 miles in 1916, and to 75,889 miles in 1921.

The total rural mileage as logged by the Division of Highways is 77,747 miles. This compilation, resulting from field studies, constitutes the most accurate mileage record thus far prepared for California.

The present State highway system consists of 14,019 miles of road, which includes some 414 miles authorized but not yet constructed. Of this 14,019 miles, 12,617 miles are located in rural territory—that is, outside of cities.

His wife determined to cure him of his bad ways and with the aid of a sheet and an electric torch transformed herself into a very fair imitation of a ghost. Then she went out to the drunkard and shook him.

"Wash that?" murmured the toper.

"Satan," came the reply in a sepulchral tone.

"Shake handsh, old horsh. I married your sister."

There were just as many careless drivers 30 years ago, but the horses had more sense.

New Office Building of District XI at San Diego Dedicated With Ceremony

By **E. E. WALLACE,** District Engineer

THE new office building of District XI of the Division of Highways in San Diego was formally dedicated on Saturday afternoon, August 3d, designated as State Department of Public Works Day at the California Pacific International Exposition.

Dedication ceremonies were preceded by a luncheon at the San Diego Hotel given by the San Diego Chamber of Commerce, city officials and civic bodies in honor of Earl Lee Kelly, Director of Public Works, members of his staff, officials of the Division of Highways and members of the State Highway Commission.

Frank G. Forward, chairman of the Highway Committee of the Chamber of Commerce, presided. Mayor Percy J. Benbough welcomed the guests of honor and expressed San Diego's appreciation of the new building, pointing out that it is the first structure to be erected in what is being developed as a Civic Center for San Diego.

WELCOME FROM SUPERVISORS

On behalf of the county, Edgar F. Hastings, chairman of the San Diego board of supervisors, welcomed the state officials and spoke in praise of the highway work that has been done in the county. Greetings from the San Diego Chamber of Commerce were extended by its president, John Lawrence Fox, following which representatives from Imperial and Riverside counties were introduced.

Brief talks were made by District Engineer E. E. Wallace, T. C. Macaulay, manager of the Chamber of Commerce, and George B. McDougall, Chief of the Division of Architecture.

State Highway Engineer C. H. Purcell made a brief response and introduced Jno. H. Skeggs, District Engineer, District IV, S. V. Cortelyou, District Engineer, District VII, and other members of his staff. He was followed by Harry A. Hopkins, chairman of the State Highway Commission.

NEW BUILDING DEDICATED

The luncheon came to an end with an address by Director Kelly, who introduced Justus F. Craemer, Assistant Director, and Edward J. Neron, Deputy Director.

After the luncheon, which was attended by more than 300 persons, adjournment was taken to the new office building located at Harbor and Ash streets for the dedication ceremony.

Following selections by the SERA band and introductory remarks by President Fox, of the San Diego Chamber of Commerce, Director Kelly, in a brief address, dedicated the building and then, as the band played the National Anthem, raised an American flag presented to him by Miss Janet Wallace, daughter to the district engineer.

The building was then opened for inspection and the public was received by the staff and employees of District XI. The latter conducted visitors through the various offices and drafting room and explained the many exhibits which had been arranged in such a manner as to outline the functions of the various employees and the procedure in highway design, construction and maintenance.

NUMEROUS FLORAL GIFTS

Many baskets of beautiful flowers were presented by friends of the district.

Following the dedicatory program, a reception in honor of Director Kelly and the Highway Commission was held at the California State Building at the Exposition in Balboa Park.

The new office building is of early Spanish architectural design 115 by 150 feet in size, and "U" shape. It contains nine offices, a large unusually well-lighted drafting room, blueprint and supply rooms, and a basement containing laboratory, furnace and supply rooms.

The second story provides an attractive conference room. The building fronts on San Diego Harbor, four blocks from Broadway and one block west of Pacific boulevard.

The new quarters provide excellent accommodations for District XI and will result in more efficient handling of the work of the district.

Designed by the Division of Architecture of the Department of Public Works, the building was constructed under its supervision.

DEDICATION SCENES AT SAN DIEGO. At top, the new office building of District XI taken during dedication exercises just before the flag raising. Below in the official group, left to right, are State Construction Engineer C. S. Pope; H. S. Comly; President Jno. Fox, San Diego Chamber of Commerce; Acting Bridge Engineer F. W. Panhorst; Chairman F. G. Forward, Chamber of Commerce; J. F. Craemer, Assistant Director and Earl Lee Kelly, Director of Public Works; Principal Assistant Engineer J. G. Standley; District Engineer E. E. Wallace; H. A. Hopkins, Chairman, C. D. Hamilton, member, and Julien Roussel, secretary, of Highway Commission; C. C. Carleton, Chief Contracts and Rights of Way and Edward Neron, Deputy Director of Public Works.

12,000,000 Tons of State Farm Products Hauled by Trucks

THE importance of motor trucking as an outstanding factor in the farming industry of California is revealed by statistics assembled by the Department of Public Works. Approximately 12,000,000 tons, or two-thirds, of the state's agricultural production, moved by truck during 1932.

Out of a total of 1,051,000 tons of agricultural and animal products delivered in the Los Angeles markets in 1933, 83 per cent arrived by truck. And of 424,000 tons of similar shipments to the San Francisco market, approximately two-thirds were delivered by truck.

The monthly receipts in Los Angeles varied from 58,516 tons in January to 93,037 tons in August, not including 200,000 tons of hay received by truck in the southern city. In San Francisco the minimum tonnage in any one month was 15,644 tons in February and the maximum was 30,909 tons in July.

SOUTH FAVORS TRUCKS

Forty-eight counties shipped agricultural and animal products by truck to Los Angeles and 52 counties shipped to San Francisco. In Los Angeles, 11 counties contributed 95 per cent of the total truck receipts and in San Francisco 17 counties accounted for 91.24 per cent of the total truck tonnage. A further analysis of live stock movements shows that the Los Angeles market favors the truck more generally than do shippers into San Francisco. In both places, trucks are preferred for the movement of calves and hogs, while sheep are shipped primarily by rail.

SAN FRANCISCO EXCEPTION

In each market, the majority of the stock from nearby counties is trucked in. Thus, Los Angeles County is the largest producer for the Los Angeles market. Practically all of its cattle are trucked in. Similarly, Marin, Alameda and Santa Clara counties, which are nearby sources for the San Francisco market, also favor the use of trucks for their stock movements. However, in the case of San Francisco there is a notable exception. From Solano County, also nearby and the second largest source of supply, trucking is negligible.

Week End Traffic 30.6 Per Cent of Average Week Total

THAT California motorists have a decided propensity for week end outings due to ideal climatic conditions is well known. To just what extent this inclination is prevalent was revealed by a road transportation survey made by the Division of Highways.

The investigation disclosed that for the greater part of the state, the combined Sunday and Monday traffic averages 30.6 per cent of the total for a typical week.

The use of motor vehicles, it was found, is confined largely to the period between 6 a.m. and 10 p.m., over 87 per cent of all traffic occurring during this portion of the day.

SLIGHT CITY DIFFERENCE

Seasonal variation of traffic in the larger cities is slight. Last year, July traffic on the main city streets exceeded that of January by only 1 per cent. Traffic on rural roads, on the other hand, shows a pronounced variation during the year, and this variation is more marked on county roads than on rural state highways.

July traffic on the latter exceeded the January traffic by 50 per cent, while on the county roads, the increase was approximately 136 per cent. Records maintained for several years past indicate that about 56.5 per cent of the total annual traffic occurs during the seven months, January to July.

WARNING GIVEN BY EDITOR TO HIGHWAY SIGN VANDALS

Alturas—Last week representatives of the State Division of Highways were here resigning the State highways 395 and 299. This service was meant as a necessary convenience to the traveling public. There were several thousand of them placed at considerable cost to the State.

This week when Wilbur Clark went over the road he discovered that the letters had been shot out of 25 of these signs by vandals.

We wish to state here that the penalty for such vandalism is a $500 fine and six months in jail. Anyone seeing such mischief done should report it into headquarters at once so that our county will get the benefits these signs are intended to bring us.—*Alturas Plain Dealer.*

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ..... Director

JOHN W. HOWE ..... Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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Highways Feed Millions

We can't eat, we can't dress, we can't go any place without in some way depending on the automobile and the roads and streets over which it runs.

Highway transportation, perhaps the nation's biggest industry, must move on and on. Spinning wheels of the highway, nearly 100,000,000 of them on 24,000,000 motor vehicles, have made themselves a vital part of every man's life.

Everything you buy rides over the highways three to a dozen times. Rural mail carriers travel over 1,350,000 miles of roads daily. Automobile tourists spend $3,000,000,000 a year. Buses annually carry 2,000,000,000 passengers, which is equal to one bus ride for everybody on earth. All this gives us only a glimpse of our dependence on the automobile and the highway.

The nation on wheels? A car for every five people. Enough to take our entire population for a ride at one time—as you may see for yourself on a sunny Sunday.

Twenty-five billion dollars is our capital investment in automobiles, garages, filling stations, factories and roads and streets; and each year we spend $9,000,000,000 that makes jobs for those who keep this business going and are engaged in extending it.

Yes, indeed, a nation on wheels! And behind it all runs the chain of employment. Jobs, jobs, 5,000,000 of them for men and women whose task it is to keep these wheels moving. One-seventh of the gainfully employed workers in the United States earn a livelihood for themselves and millions of dependents to supply us with automobiles, gasoline, tires, tubes, accessories, and roads and streets.—*Florida Public Works.*

Auto Registrations Show Gain of 113,464 in Six-month Period

A RECORD gain in motor vehicle registration in first six months of this year, bringing increase in apportionment of funds for highway development and repair, gave new evidence of improved business conditions in California.

Reporting to Governor Frank F. Merriam, Director Ray Ingels of Department of Motor Vehicles and State Highway Commissioner, announced a total of 2,077,350 fee-paid registrations for the six-month period ending June 30 and a consequent apportionment of $5,565,586.34 for highway construction and repair.

Half of the apportionment, $2,782,793.17, goes to the Division of Highways for development and repair of state roads. The other half is shared by the 58 counties for highway improvement and construction in their political subdivisions, the allotment being based on vehicle registrations in the counties.

LARGEST SINCE 1929

"With the six-month apportionment figure exceeding that of the same period for 1934 by $422,217.54 and being greater by $121,388.10 than the 12-month total of last year, there is no question concerning California's upward business trend," said Director Ingels. "Registration of motor vehicles from January 1 to June 30 was the heaviest since 1929 and every county listed a gain in the total increase of 113,464 registrations over the first six months of 1934."

The six-month total in registrations included the following classifications: Automobiles, 1,870,623; solid tire trucks, 3669; pneumatic tire trucks, 116,438; motorcycles, 7782; solid tire trailers, 5948; pneumatic tire trailers, 72,890.

So-o-o!

Two spinsters were discussing men—"Which would you desire most in your husband—brains, wealth, or appearance?" asked one.

"Appearance," snapped the other, "and the sooner the better."—*Georgia Highways.*

He called on the neighbor to borrow the use of the 'phone. Then he called up the butcher.

"Ye dinna need to send up that pennyworth o' cat meat," he said. "Kitty has caught a mouse."—*Recorder.*

How Land Is Secured for Highways Diplomatic Envoys in State Employ

By **C. C. CARLETON,** Chief, Division of Contracts and Rights of Way

THIS is the twenty-fourth year of systematic state highway building in California.

While considerable right of way activity has from the outset been prerequisite to the highway work, yet it has been only for a few years that it has become recognized as of major importance on a parity with the engineering itself.

The cost of right of way now represents about 12 per cent of the total state highway construction disbursements.

In earlier years old county roads with their existing widths were adopted as links in the state highway system and any necessary new rights of way were obtained through the county boards of supervisors or civic organizations interested in promoting projects of particular interest to themselves.

C. C. CARLETON

FORTY STAFF EMPLOYEES

But with the advent of the gas tax and consequent greater state highway accomplishments and bolder treatment of highway location and construction, it became imperative that the state itself establish its own right of way organization.

The staff consists at present of about forty employees, eight of whom have had legal education, the remainder possessing either a special training in right of way, real estate, or appraising practice, or such other business background as will readily adapt them for successful service in this field. All employees are subject to civil service laws.

The minimum statutory width of right of way for state highway in California is 80 feet.

However, the State Highway Commission has now prescribed a minimum width of 100 feet for the trunk lines.

It becomes obvious that, as the minimum statutory width of county roads was only 40 feet, the present day widening and altering of these old roads to modern state highway standards is creating right of way problems of major proportions, as a large mileage of the state highway has now become closely built up or bordered by expensive improvements.

Moreover, within recent years almost a thousand miles of city streets have been added to the state highway system which further augment the complications of state highway right of way acquisitions.

The policy of the state is to deal with all owners "fairly and squarely," but it requires the "tact and contact" of 40 trained and experienced men to handle the situation, nevertheless.

SETTLED BEFORE TRIAL

Condemnation proceedings are invoked only after friendly overtures have been unavailing, and even if such proceedings are instituted, a large percentage of them are settled before trial.

The constitution of California was amended in 1918 enabling the state to deposit money seecurity in court when the condemnation proceedings are commenced and to take immediate possession of the desired right of way without awaiting results of a trial.

But despite this summary procedure the right of way agents are admonished to speed up their negotiations to the end that landowners shall have had ample opportunity to

Right of Way Man an Advance Agent

(Continued from preceding page)

settle before being haled into court and as little personal embarrassment as possible occasioned.

The Division of Contracts and Rights of Way is one of the bureaus of the State Department of Public Works.

HOW THEY WORK

This division is in charge of a chief, who must be an attorney at law, and who coordinates all right of way activities of the department.

The right of way staff consists of two classes: one devoting itself to work largely of a legal nature and the other to visiting those having some interest in the land sought to be obtained and getting their signatures "on the dotted line."

The court work relating to condemnation proceedings is more directly in charge of the Assistant Chief of the Division of Contracts and Rights of Way, an attorney at law, who is aided by three assistants with legal training called "condemnation investigators."

The Assistant Chief specializes in condemnation proceedings and passes upon the sufficiency of land titles.

The condemnation investigators assist him by acting as his field representatives in settling cases before trial, or in the event that cases can not be settled, in visiting the localities where the cases are to be tried and preparing for the impending trials by interviewing witnesses and attending to all other necessary preliminary trial work. They must also be qualified to act as attorneys in cases should the assistant chief be unable personally to handle them due to stress of other duties.

LEGAL FLYING SQUADRON

Practically the entire time of this legal flying squadron is engaged in the trial of the many condemnation cases in progress in the 58 counties of the state.

Also attached to the office of the Chief of the Division of Contracts and Rights of Way are three aides of legal training who are designated as general right of way agents.

They are the liaison agents of the chief in his contacts with the district right of way agents. They are subject to orders to go to any part of the state to deal with the legal or even the solicitation phases of the district right of way activities.

IN DISTRICT OFFICES

The state highway work in this state is handled regionally by 11 district offices.

The local right of way activities, such as actual field negotiations for necessary rights of way, are ordinarily conducted by district right of way agents attached to the district offices. The district right of way agent is in turn aided by several assistant district right of way agents.

These district right of way agents form the real backbone of the right of way organization, as upon them largely rests the success and the popularity of the state's endeavors to lay its ribbons of roadway over private property with as little private detriment as possible.

REAL DIPLOMATIC AGENTS

They are the advance agents who, without regard to their own personal comfort or convenience, must constantly be at the wheels of their cars visiting landowners, however far off the beaten path they may find them, smilingly attempting to convince such landowners (some very redoubtable) of their sincerity of purpose and their desire to deal fairly with them.

The "right of way man" has now become recognized in this state as being as essential to an effective state highway organization as the engineer. In fact, a good "right of way man" in the complexities of modern highway construction must be quite a paragon.

ALL-ROUND ABILITY NECESSARY

He must be informed concerning the law of land titles, have at least a rudimentary knowledge of engineering and the ability to read maps and blue prints, able properly to appraise property values, a keen analyst of human nature and the possessor of an agreeable personality and an unswerving integrity.

In closing, may the writer be pardoned for the facetious observation that, despite the trials and tribulations of the "right of way men," theirs must really be a very absorbing vocation, evidenced by the fact that in California they rarely if ever voluntarily resign to enter other lines of endeavor.

Coast Boulevard in Laguna Beach Widened and Paved, Grade Improved

By **R. C. MYERS,** Assistant District Office Engineer

CONSTRUCTION of the latest project on the Coast boulevard in the city of Laguna Beach, from Cypress street to the south city limits, was completed under state highway contract on July 26th, thus eliminating the last unimproved section of this important highway between Long Beach and its junction with the original state highway route to San Diego, at Doheny Park.

Starting work on February 25th, the contractor carried forward this project with such speed that all pavement was completed by May 20th, several days before the opening of the San Diego Exposition on May 29th, which was the scheduled date for the 40-foot pavement to be opened to traffic. This fine record was made in spite of extremely difficult conditions, and several unforeseen obstacles that caused delays in construction operations.

AN EXPENSIVE OPERATION

Reconstructed and widened at a cost of $141,000 this 1.09 mile section of highway formerly consisted of only a 30-foot oil surfaced roadbed with private improvements crowded so closely on each side as to make the widening of the highway difficult and expensive.

It was recognized from the start that these realty improvements, consisting of business buildings as well as private garages and dwellings located on steep hillsides, would either have to be moved back or expensive retaining walls built.

Each one of these right of way matters was handled as an individual problem, and the cost of moving back the improvements and constructing retaining walls, or a combination of these two methods, was carefully considered, so that the most economical method of handling the problem could be used in each case.

OLD FILLS REBUILT

In addition to these difficult right of way matters which were anticipated and provided for, it was found that the fill material of the existing highway across canyons, which had been put in many years before by the "end dump" method, was not compacted sufficiently for the placing of a high type modern pavement.

Tests proved that some of these fills were susceptible to settlement of several feet when saturated with water. To eliminate any settlement which might be destructive to the new pavement, it was decided to build "from the ground up." The old fills were torn down and rebuilt by the modern method of spreading in thin layers and watering and rolling.

All of this required additional time and increased the difficulty of having the pavement opened for the beginning of the San Diego Exposition.

In spite of these additional difficulties the work was so well coordinated and the contractor and city officials of Laguna Beach cooperated so whole-heartedly with the State Highway Construction Department that the work was finished well ahead of scheduled time.

This improvement is the last remaining link of the coast highway through Laguna Beach to be permanently improved.

74-FOOT ROADWAY

Construction on this new contract is 72 feet between curbs with 2-foot gutters and a 40-foot pavement, the width of right of way being 80 feet. The previously existing highway consisted of a 30-foot roadbed, and widening this to 74 feet between curbs will be an immense help to traffic. The areas between the edges of pavement and the concrete gutters have been oiled and seal coated, making this entirely suitable for light automobile traffic.

The full 80-foot width of right of way was graded so that a 4-foot width of sidewalk space was left on each side for pedestrians. Formerly all pedestrians had to use the narrow roadbed with hazard not only to them but to the heavy stream of automobile traffic as well.

STREET GRADES CHANGED

The project also included many improvements of grade to increase the clear sight dis-

(Continued on page 31)

LAGUNA BEACH in Orange County is rejoicing in the completion of a three-lane, hard surfaced sector of highway along the coast and through the city. The work involved construction and right of way problems that included big cuts through hills, rebuilding old fills and setting back improvements for the new, widened grade, particularly in the artist colony area. Above is part of the highway extending north past beautiful vistas of bay and sea and beach. Below, a view of the Coast Boulevard from the south city limits, passing numerous studio villas clustered on the hillsides.

How Cities May Use Extra $3,000,000 Gasoline Tax Voted by Legislature

By **L. V. CAMPBELL,** Engineer, City and Cooperative Projects

GOVERNOR FRANK F. MERRIAM affixed his signature to Senate Bill No. 561 on July 15, 1935, completing the enactment of legislation which provides an amount equal to the net revenue derived from one-quarter cent per gallon tax on motor vehicle fuel, or the State gasoline tax, for the improvement and maintenance of city streets other than the streets comprising designated State highway routes within municipalities.

Legislation enacted in 1933 allocated a similar amount of one-quarter cent of the gasoline tax from the State highway fund for the maintenance and improvement of State highway routes within incorporated cities. As a result of the last act the annual expenditure of gasoline tax funds inside cities will be doubled over previous years and it is estimated that there will be available for expenditure $3,000,000 a year for state highways within cities and $3,000,000 a year for city streets of major importance.

BASIS OF APPORTIONMENT

Apportionment of the fund is prescribed by the act in the proportion that each city bears to the total population of all cities in the state, using the last preceding Federal census as the basis. Provision is also made to include cities incorporated subsequent to the last, or 1930, Federal census and for the inclusion of unincorporated territory annexed since that date. In both cases, where the population is not in the census, the per capita allowance will be ascertained by multiplying the number of registered electors by a factor of three.

Both the one-quarter cent for State highways and the quarter cent for city streets is to be expended under control of the Department of Public Works. Coupled with this control are restrictions to require expenditure for certain purposes qualifying as traffic benefits.

EXPENDITURE RESTRICTED

In its broadest term, the act restricts expenditure of the city street one-quarter cent to the purchase of right of way, construction, maintenance and improvement of streets of major importance, other than State highways. The designation of the streets of major importance is to be agreed upon by the city and the State.

A further restriction limits the expenditure to the effective roadway or that portion of the street available for use by vehicular traffic. As traffic benefit is the essential qualification for expenditure an exception is made to include the installation and maintenance of traffic control devices and the construction of pedestrian underpasses where there is a distinct hazard to pedestrians attempting to cross heavy traffic arteries and where such underpasses facilitate traffic movement.

An explicit prohibition is made, however, upon the expenditure for street lighting and upon the construction and maintenance of sidewalks or any structure or facility which is not of direct and primary service to vehicular traffic.

STATE APPROVAL REQUIRED

While full responsibility for the expenditure of the money is placed upon the Department of Public Works, the act requires the department to delegate the expenditure to cities for such work as the department is satisfied can be conducted competently by the city.

To gain approval of work, the act requires each city to submit an annual budget, or program, to the department before the first day of June of each year, showing the estimated cost and nature of the work contemplated. Disapproval of the budget or any item included in the budget is vested with the department to be exercised if the proposed work does not meet the requirements of the law.

Upon approval of a city's budget, the act provides that the department shall remit quarterly, as the gas tax revenue is received in the State highway fund, the proportion of the pro rata share which has been delegated to the city. All money as received from the State is to be deposited in a "special gas tax street improvement fund," to be specifically created by the legislative body of each city for this purpose. According to the act, the

GOVERNOR FRANK F. MERRIAM SIGNING THE BILL increasing allocation of gas tax funds to cities. Left to right: Mayor Arthur Ferguson, Sacramento; Mayor Conje Frank, Stockton; City Manager James S. Dean, Sacramento; Hollis P. Thompson, City Manager, Berkeley; Director of Public Works Earl Lee Kelly; W. B. Hogan, City Manager, Stockton; John F. Hassler, City Manager, Oakland.

delegation of expenditure and the payment of funds to the city shall only be made in relation to approved items of the budget.

The actual expenditure of money for approved projects can not be made, however, until the city submits and receives approval of the department of such plans and specifications as the department may require. With approval of the plans and specifications, the city may proceed to advertise a project for construction bids. If the bids received are in excess of the estimated cost or if the low bidder is not responsible, the act requires that the consent of the department must be obtained before the city may award the contract.

A similar clause stipulates that the written consent of the department must be obtained before the amount of any item in the approved budget may be exceeded, whether for maintenance or purchase of right of way.

In order that cities which contemplate a major improvement beyond the resources of their annual allocation may provide sufficient funds to accomplish the project in its entirety, a section of the act enables such cities to accumulate funds over a period of years until a sufficient amount is available to finance the cost of the improvement.

The stipulation relative to the one-quarter cent previously allocated for state highway routes within cities, received no significant change in the last act. These funds with full responsibility are given to the state for the maintenance and improvement of streets constituting the State highway routes. Expenditure upon the State highways is the primary purpose of this fund, although the act provides that after all the State highways within a city have been improved to adequate standards and adequate provision made for their maintenance, any surplus remaining may be expended upon other streets of major importance within the city.

Enactment of the law compelling the expenditure of an additional one-quarter cent of the gas tax within cities, after the California Highway Commission had adopted its budget for the present biennium ending June 30, 1937, will mean a redrafting of the State highway budget in order to bring proposed construction expenditures in adjustment with the withdrawal of the additional funds to be spent upon city streets during the present biennium. The necessary adjustments will reduce the funds available from State revenues for construction about 20 per cent during the biennium.

Highway Bids and Awards for July

ALAMEDA COUNTY—Thirty-eighth Street and Moss Avenue, between Market Street and Broadway, about 0.9 mile to be graded and paved with Portland cement concrete and asphalt concrete. District IV, Route 5, Section Oak. Union Paving Co., San Francisco, $113,291; N. M. Ball Sons & J. Catucci, Berkeley, $106,969; Heafey-Moore Co., Oakland, $113,566; Fredrickson-Watson Const. Co., Fredrickson Bros., Oakland, $113,743; Southern California Roads Co., Los Angeles, $123,748. Contract awarded to Peninsula Paving Co., San Francisco, $103,826.65.

BUTTE, COLUSA AND GLENN COUNTIES—Furnishing and applying liquid asphalt to existing roadbed for about 41 miles. District III, Routes 21-88, Sections B, B "R," C "R"-A-C. A. Teichert & Son, Inc., Sacramento, $13,655; Lee J. Immel, Berkeley, $12,818; Hayward Bldg. Mtls. Co., Hayward, $14,587; C. F. Fredrickson & Sons, Lower Lake, $12,105. Contract awarded to Edw. F. Hilliard, Sacramento, $11,620.

CONTRA COSTA COUNTY—Furnish and apply liquid asphalt SC-2 between park boundary near Danville and the summit, and between the forks and the toll house near Walnut Creek, about 19.1 miles. District IV, Route Mt. Diablo Park Road. Lee J. Immel, Berkeley, $2,607; Ransome Co., Emeryville, $2,537; Hayward Building Mtl. Co., Hayward, $2,432. Contract awarded to Palo Alto Road Materials Co., Ltd., Palo Alto, $2,170.

IMPERIAL COUNTY—Between Bond's corner and Niland, 40.2 miles to be treated with liquid asphalt. District XI, Routes 187 and 201, Sections A,B,C & E, and C. Gilmore Oil Co., Los Angeles, $8,544; Square Oil Co., Los Angeles, $10,080; Paulson & March, Los Angeles, $9,571. Contract awarded to Morgan Bros., Huntington Park, $8,380.80.

KERN COUNTY—Seal coat Buttonwillow to 4.3 miles west. District VI, Route 58, Section J. John Jurkovich, Fresno, $4,510. Contract awarded to Palo Alto Rd. Materials Co., Ltd., Palo Alto, $2,537.82.

KINGS, TULARE COUNTIES—Between 1 mile east of Corcoran and Tulare and between Lindsay and 4.3 miles west. About 20.3 miles to be treated with seal coat. District VI, Route 134, Section A, A-B. E. A. Forde, San Anselmo, $13,979; Palo Alto Bd. Matl. Co., Ltd., Palo Alto, $14,073; Oilfields Trucking Co., Bakersfield, $18,415; A. Teichert & Son, Inc., Sacramento, $14,650; L. A. Brisco, Arroyo Grande, $14,229; Clyde W. Wood, Stockton, $14,107. Contract awarded to Stewart & Nuss, Inc., Fresno, $13,397.50.

LOS ANGELES AND KERN COUNTY—Between Lancaster and Mojave road-mix surface treatment to be applied to existing roadbed shoulders for a distance of about 13.7 miles and a bituminous seal coat to be applied to treated shoulders for a distance of about 24.9 miles. District VII, Route 23, Section G & A. Gogo & Rodos, Los Angeles, $30,446; A. S. Vinnell Co., Los Angeles, $30,628; John Jurkovich, Fresno, $33,985; M. J. B. Construction Co., Stockton, $34,218; C. W. Wood, Stockton, $33,467; Geo. R. Curtis Pav. Co., Los Angeles, $34,366. Contract awarded to Basich Bros., Torrance, $27,892.50.

LOS ANGELES COUNTY, Cerritos Ave.—Between Los Angeles Street and Artesia Ave., 2.1 miles grade and asphalt concrete or Portland cement concrete pavement. District VII, Route 168, Section A. Griffith Co., Los Angeles, $55,079; Sully Miller Contr. Co., Long Beach, $58,169; Geo. R. Curtis Pav. Co., Los Angeles, $67,649. Contract awarded to Oswald Bros., Los Angeles, $55,064.

LOS ANGELES AND VENTURA COUNTIES—Between Little Sycamore Canyon and Encinal Canyon, 5.6 miles, grade and Portland cement concrete pavement and widen two bridges. District VII, Route 60, Section A. Hanrahan-Wilcox Corporation, San Francisco, $226,666; Basich Bros., Torrance, $246,086; C. O. Sparks & Mundo Eng. Co., Los Angeles, $260,108; Sander Pearson, Santa Monica, $255,192; Griffith Co., Los Angeles, $273,584; Sharp & Fellows Contr. Co., Los Angeles, $240,832; J. E. Haddock, Ltd., Pasadena, $275,336. Contract awarded to Oswald Bros., Los Angeles, $219,606.25.

MADERA COUNTY—Between Coarse Gold and Oakhurst about 7.8 miles to be surfaced with plant mixed surface on a crusher run base. District VII, Route 125, Section C, D. Griffith Company, Los Angeles, $115,347; Central States Contracting Co., Ltd., Oakland, $125,305; Basich Brothers, Torrance, $121,933. Contract awarded to A. Teichert & Son, Inc., Sacramento, $105,708.60.

MODOC AND SISKIYOU COUNTIES—Between 2½ miles SE. of Tule Lake and Oregon state line, about 5.5 miles to be graded. District II, Tule Lake Road. Contract awarded to Biasotti, Willard & Biasotti, Stockton, $144,103.25.

MONTEREY COUNTY—Between King City and San Ardo and between Salinas and Monterey-Santa Cruz County line, about 37.2 miles shoulders to be treated with liquid asphalt. L. A. Brisco, Arroyo Grande, $7,452; Granite Constr. Co., Inc., Watsonville, $7,587; Walter B. Roselip, San Luis Obispo, $7,603; Paulsen & Marsh, Inc., Los Angeles, $7,614. Contract awarded to Gilmer Oil Co., Los Angeles, $6,669.

NAPA COUNTY—At various locations between Carneros Creek and Napa, about one and one-tenth miles in length to be graded and surfaced with crusher run base and plant-mixed surfacing. Napa County, District IV, Route 8, Section A. E. A. Forde, San Anselmo, $18,619; Pacific States Construction Co., San Francisco, $19,652; Harold Smith, St. Helena, $19,877. Contract awarded to J. A. Casson, Hayward, $17,915.

NAPA COUNTY—Between Wooden Valley Junction and Napa-Yolo County line furnishing and applying liquid asphalt, SC-3, about 23 miles. District IV, Route 6, Section B, C. Hayward Building Mtl. Co., Hayward, $4,381. Contract awarded to Basalt Rock Co., Inc., Napa, $3,913.

ORANGE COUNTY—Remove and stockpile railroad track material. District VII, Route 174, Section Ana.-A. Pacific Crane & Rigging, Inc., Los Angeles, $1,925; Shannahan Bros., Inc., Los Angeles, $2,220; C. O. Sparks, Los Angeles, $2,500; Dimmitt & Taylor, Los Angeles, $2,812; Paul R. Hughes, Long Beach, $3,590. Contract awarded to United Commercial Co., Inc., Los Angeles, $1,303.35.

PLUMAS COUNTY—Between Route 29 and Almanor Dam and between south end of Government Section & Route 21 (II-Plu-83-B, C, D). Between Keddie and Quincy between Blairsden and Delleker, and between Quincy and Meadow Valley (II-Plu-21 C, F, C, "R"). About 59.4 miles to be treated with liquid asphalt. District II, Routes 83, 21, Sections B, C, D-C, F, C "R." A. Teichert & Son, Sacramento, $25,784; Tiffany Construction Co., San Jose, $24,383. Contract awarded to C. F. Fredricksen & Sons, Lower Lake, $22,632.65.

RIVERSIDE AND SAN BERNARDINO COUNTIES—Between 6 miles north of Blythe and Vidal, 33.5 miles to be treated with liquid asphalt. District XI, Route 146, Section C, D, E, & A. J. A. Casson, Hayward, $44,004; Basich Bros., Torrance, $44,364; R. E. Hazzard Con. Co., San Diego, $44,434; Martin Bros., Trucking Co., Long Beach, $49,483; Geo. Herz & Co., San Bernardino, $64,228; Oswald Bros., Los Angeles, $67,940. Contract awarded to C. W. Wood, Stockton, $42,020.90.

SACRAMENTO COUNTY—Grading and surfacing crusher run base. District III, Route 100, Section A. A. Teichert & Son, Inc., Sacramento, $5,942. Contract awarded to Lee J. Immel, Berkeley, $5,651.90.

SAN BERNARDINO COUNTY—Between Summit Station and the West Fork of the Mojave River on the Cajon-Lake Arrowhead road about seven and two-tenths (7.2) miles in length to be treated with liquid asphalt. District VIII, Route 59, Section C. Gilmore Oil Co., Los Angeles, $1,348; Morgan Bros., Huntington Park, $1,433; Square Oil Co., Los Angeles, $1,568. Contract awarded to Paulsen & March, Inc., Los Angeles, $1,224.

SAN DIEGO COUNTY—20.8 miles to be treated with liquid asphalt between Descanso and Julian. District XI, Route 78, Section A & B. Square Oil Co., 916 Adobe St., Los Angeles, $6,000; Paulson & March, Los Angeles, $6,115; Gilmore Oil Co., Los Angeles, $6,490. Contract awarded to Morgan Bros., Huntington Park, $5,625.

SAN DIEGO COUNTY—Between Bonsall and Rincon and between Santa Ysabel and northerly boundary, 54.7 miles to be treated with liquid asphalt. District XI, Routes 195 and 78, Sections B and C, C,D & E. Square Oil Co., Los Angeles, $14,575; Paulson & March, Los Angeles, $12,521; Gilmore Oil Co., Los

(Continued on page 32)

Work Put Under Way Last Month

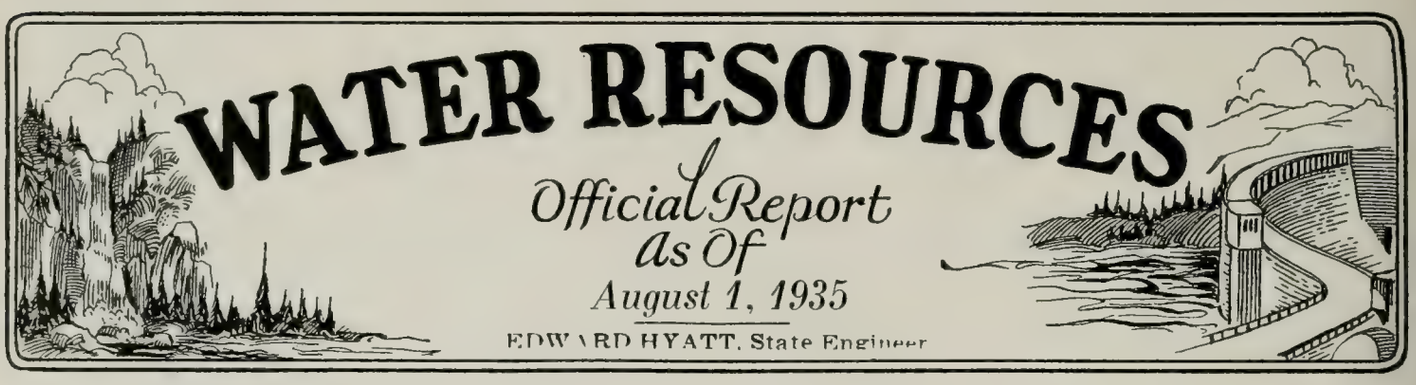
The estimated total of contracts awarded and projects advertised from July 1 to July 31, inclusive, by the Division of Highways is $2,394,800. The work thus put under way includes 63 miles of grading, paving and bituminous treated crushed rock surfacing, 817 miles of road and shoulder oiling and 4 bridges and grade separations, as follows:

MAJOR CONTRACTS AWARDED

County	Location	Miles	Type
Napa	Carneros Cr. to Napa	1.1	Bit. tr. surf.
Sonoma	In Santa Rosa	1.4	Pavement
Santa Clara	Near Agnew	0.4	Grade separation
Alameda	38th St. & Moss Ave. in Oakland	0.9	Pavement
Los Angeles-Ventura	Little Sycamore Canyon to Encinal Canyon	5.7	Pavement
Kern	1 mile south of Delano	1.0	Grade separation and approaches
Stanislaus	Newman to Crows' Landing	4.5	Bit. tr. rock surf.
San Mateo	Edgemar to Thornton	3.6	Bit. tr. rock surf.
Siskiyou	Weed-Klamath Road	8.2	Graded roadbed
Sacramento	Steamboat Slough to one-half mile east	0.4	Bit. tr. surf.
Madera	Coarsegold to Oakhurst	7.8	Bit. tr. rock surf.
Modoc-Siskiyou	Tule Lake to Oregon Line	6.8	Graded roadbed
Los Angeles	Los Angeles St. to Artesia Ave.	2.1	Pavement
San Bernardino	In Redlands	2.0	Pavement
Santa Cruz	Ocean St. in Santa Cruz	0.4	Pavement
23 counties	Various locations	522.2	Road and shoulder oiling

PROJECTS ADVERTISED

County	Location	Miles	Type
San Bernardino	In Colton	1.2	Pavement and bridge
San Bernardino	In Colton	1.0	Grade separation
Los Angeles	La Veta Terrace to Santa Monica Blvd.	1.4	Pavement
Nevada-Placer	Soda Springs to Donner Summit	3.7	Drainage installation
El Dorado	Kyburz to Strawberry	7.9	Drainage installation
Santa Clara-Santa Cruz	Saratoga Gap to Black Road	1.3	Slide Removal
El Dorado	In Oglesby Canyon	1.0	Bit. surf. treatment
6 counties	Various locations	295.6	Road and shoulder oiling



The Allotment Board of the Works Progress Administration on July 23d, at Washington, approved a list of projects recommended by the U. S. Bureau of Reclamation among which was an apportionment of $20,000,000 for the construction of California's Central Valley project. No definite details as to the set up proposed for construction of the project under the Bureau of Reclamation have been received to date but it is understood that after presidential approval of the board's action, Dr. Elwood Mead, U. S. Reclamation Commissioner, is to come to Sacramento to initiate arrangements for starting work. Dr. Mead announced the $20,000,000 allotment saying presidential approval and treasury action will make the money available almost immediately.

News of the irrigation districts, flood control, dam applications and other activities of the division is contained in the regularly monthly report of the State Engineer as follows:

IRRIGATION DISTRICTS

At a hearing in Bakersfield July 17th, conducted by W. P. Boone and D. J. Coyne, executive directors, as provided under section 2 of the California Water Storage District Act, a petition to the State Engineer for the formation of the North Kern Water Storage District was approved. Final action on organization is subject to the decision of the land owners in the proposed district voting at a special election to be called by the State Engineer. The district as proposed contains 58,673 acres of land, extending north from Lerdo to McFarland, and mostly enclosed between the Southern Pacific railroad on the east and the Santa Fe railroad on the west.

Districts Securities Commission

The Districts Securities Commission approved plan of readjustment and filing of petition under Federal Bankruptcy Act by the Jacinto Irrigation District. The commission also approved an agreement between the Reconstruction Finance Corporation, Richvale Irrigation District and Sutter Butte Canal Company.

FLOOD CONTROL AND RECLAMATION

SERA Relief Work

A crew of 28 men is now working on clearing and grubbing Stohlman Ridge in the upper Sutter By-pass. These are from the federal transient camp in Sutter Basin.

A crew of 40 men has been engaged in clearing timber and brush from the right bank of the Mokelumne River near New Hope Landing. To date 14,688 man hours of relief labor have been utilized.

New applications are now being prepared to cover unfinished SERA projects to carry on under the Works Progress Administration. It is expected that much relief labor will be available by early fall, to be applied principally to by-pass and channel clearing.

Sacramento Flood Control Project

Reports have been rendered on a number of applications before the Reclamation Board and several examinations were made of work being done under approved applications.

The Reclamation Board has requested the Division of Water Resources to construct one bridge and install four culverts in the new levee borrow pit about four miles above Colusa, at an estimated cost of $3,500.

Several conferences have been held with the officers of the Reclamation Board and its consulting engineers in regard to the new program for bank protection and levee construction, including an interview with General Jackson of the United States Engineers.

San Joaquin River

The Governor has approved SB 1131 (Chapter 365) appropriating $10,000 to be expended by this division for emergency levee work on the San Joaquin River. Surveys have been made and plans are being prepared so work can proceed without delay.

DAMS

Application for repair of the Upper Feeley Lake dam of the Pacific Gas and Electric Company was filed on June 22, 1935. The work consists of the reconstruction of a portion of the downstream face. This application was approved on July 3, 1935.

Application for alteration of the Lake Legunitas dam was filed on July 3, 1935. This dam is owned by the Marin Municipal Water District. The work contemplated is the reconstruction of the spillway and increase in operating freeboard on the structure. This application was approved on July 15, 1935.

Cajalco Dam Application Approved

(Continued from preceding page)

Application for construction of the Cajalco dam in Riverside County by the Metropolitan Water District of southern California was approved on June 26, 1935.

Application for construction of Peoples Weir dam on the Kings River for the Peoples Ditch Company was approved on July 15, 1935.

The state's consulting board consisting of Professor Chas. D. Marx, F. C. Herrmann and W. L. Huber spent several days during this period in the review and consideration of further revisions of plans for construction of San Gabriel No. 1 dam of Los Angeles County Flood Control District.

Preliminary excavation work is under way on construction of the Grant Lake dams on Rush Creek by the city of Los Angeles, Bureau of Light and Power.

Work on the Santa Clara Valley Conservation District's dams is progressing rapidly, requiring frequent inspections by this office.

The construction of a roadway to the Mad River dam of the city of Eureka has been completed and foundation excavation for the structure is to be started shortly.

The usual maintenance and operation inspections have been carried on as well as the inspections required of the work above outlined and repair work now being undertaken on dams in the higher altitudes.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The report for 1933 and 1934 comprising the records of all diversions, stream flow and return flow throughout the Sacramento-San Joaquin territory and Delta salinity records has been completed and a limited number are available for distribution.

The measurements and records for the 1935 season are continuing under a reduced program. There has been a gradual drop in the flow of the Sacramento River at Sacramento so that on July 22d the discharge was 3700 second feet. This compares with 1100 second feet on the same date in 1934. On July 6th the flow of the San Joaquin River near Vernalis was 4500 second feet as compared to 440 on July 6, 1934.

The salinity at upper Bay and Delta stations as shown by water samples taken on July 14th, is shown in the following tabulation. This shows also a comparison with the corresponding salinity on July 14, 1934.

Comparison of Salinity at Upper Bay and Delta Stations on July 14, 1934, and July 14, 1935

Station	*Salinity in parts of chlorine per 100,000* 7/14/34	7/14/35
Point Orient	1800	1480
Point Davis	1500	1040
Bulls Head	1360	800
O and A Ferry	700	11
Collinsville	620	20
Emmaton	280	3
Antioch	440	10
Jersey	238	3
Rindge Pump	15	9
Middle River	11	4

AUTO CLUB EXECUTIVE THANKS DISTRICT STAFF MEMBERS ON LAGUNA JOB

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA
Los Angeles

July 26, 1935.

Mr. S. V. Cortelyou,
District Engineer,
Division of Highways,
Los Angeles, California.

Dear Mr. Cortelyou:

Through you, I wish to express my appreciation to Mr. Mitchell and Mr. Whittemore, of your organization, and Mr. McDaniels, of the J. E. Haddock, Ltd., for their courteous and considerate handling of the numerous and sundry details incident to the improving of State Route No. 3 by our property in Laguna Beach.

The possibilities of inconvenience and misunderstanding were manifold, but throughout, due to their courtesy and consideration, these were nonexistent.

Again thanking them, through you, for their many instances of thoughtfulness, I am

Very truly yours,

E. B. LEFFERTS, Manager,
Public Safety Department.

Editor's Note.—Mr. R. H. Mitchell was the Resident Engineer and E. N. Whittemore, the Right of Way Agent, both of District VII.

WATER RIGHTS

Supervision of Appropriations of Water

Twenty-four applications to appropriate water were received in June, 12 were denied and 16 were approved. During the same period 1 permit was revoked and 6 passed to license.

Inspections of projects preliminary to the issuance of a license or revocation of permit were made during June in Kern, Kings, Fresno, Madera, Amador, Alpine, El Dorado, Placer, Nevada, Sierra and Plumas Counties.

TOPOGRAPHIC MAPPING

The final sheets of the Newport Beach quadrangle in Orange County are now available. This area was resurveyed in 1932 and final sheets are published on a scale of 1:31,680 with a contour interval of 5 feet.

Sulphur Slide in Santa Ana Canyon Eliminated by New Highway Relocation

FOR YEARS a menace to motorists, the steep and dangerous five-mile stretch of road passing Sulphur Slide in Santa Ana Canyon in Orange County has been eliminated by the Division of Highways of the Department of Public Works.

Dedication of the new highway, which is a cutoff 3.44 miles in length doing away with the Sulphur Slide grade, was celebrated with fitting ceremonies attended by State officials and representatives of Riverside, Orange, San Bernardino, Imperial and Los Angeles counties on July 27.

The new strip of highway was built at a cost of $174,144.36. The roadbed is 50 feet wide with a concrete pavement 20 to 30 feet wide and shoulders of oiled road 10 feet wide on each side. It extends from four-tenths of a mile east of Peralta School to Gypsum Creek.

CHANNEL CHANGE NECESSARY

Construction of the cutoff necessitated changing the course of the Santa Ana River. This was accomplished by building 5534 lineal feet of bank protection fence along the floor of the canyon to protect the new route from damage during high water in the river. Railroad rails bound with wire mesh, backed with tree cuttings and boulders, were used in erecting the fences.

Building of the road required a number of cuts through the canyon, one of which is 160 feet high.

The completed project is a portion of one of the most important routes between Orange County and the coast and inland districts of Riverside and San Bernardino counties. It carries an unusually large volume of traffic with a high percentage of trucking, and is expected to cause a big increase in travel between the fertile valley sections around Riverside, San Bernardino and Orange counties and the southerly coastal counties of California.

The new highway saves about fifteen minutes average driving time between Orange County and inland points besides eliminating the dangerous Sulphur Slide grade where many accidents, some of them fatal, have occurred in the past. The old road presented difficulties to residents of Riverside County desiring to motor to the beaches of Orange.

DEDICATION CEREMONIES

The dedication celebration was arranged by the Associated Chambers of Commerce of Orange County and the Imperial Highway Association assisted by officials of the State Division of Highways.

Justus F. Craemer, Assistant Director of Public Works, represented Governor Frank F. Merriam, who was unable to attend, and Frank A. Tetley of Riverside, retiring State Highway Commissioner, was the guest of honor and speaker of the day. Illness prevented Phil Stanton, State Highway Commissioner from Anaheim, from attending.

The ceremonies were opened by George Kellogg, secretary of the Imperial Highway Association and president of the Associated Chambers of Commerce of Orange County who introduced Willard Smith, chairman of the board of supervisors, as chairman.

In addition to talks by Craemer and Commissioner Tetley, brief remarks were made by Nat Neff, Orange County highway superintendent; Supervisor LeRoy Lyon of Orange, president of the Imperial Highway Association; John E. McGregor, chairman of the Riverside board of supervisors; Supervisor William Jerome of Orange; Ralph Stanfield of Riverside; S. V. Cortelyou, district engineer in charge of State highway construction; A. C. Fulmore, engineer of Riverside; E. B. Criddle, mayor of Riverside; Dan Hawkins, mayor of Corona; Paul Lewis, secretary of Riverside Chamber of Commerce; Fred Snedecor, president of Corona Chamber of Commerce; Clyde Simons, president of Yorba Linda Chamber of Commerce; J. L. Davis, president of Riverside Chamber of Commerce, and C. R. Butterfield.

Commissioner Tetley spoke of the old route through Santa Ana canyon and told of the difficulties encountered by motorists making a trip to the beaches. He mentioned a number of new projects contemplated by the State Highway Commission for this year.

"I don't like the way you're holding that gun."
"Well, I don't aim to please."

A JUBILEE EVENT was the celebration attending the dedication of the highway relocation in Santa Ana Canyon on July 27 marking the passing of the dangerous Sulphur Slide. In the group gathered on a high point overlooking the old and new roads are State, county and civic body officials, including Assistant Director of Public Works Justus F. Craemer, representing Governor Merriam; Frank A. Tetley, retiring Highway Commissioner. Below is shown a part of the new highway with its wide concrete pavement and oiled shoulders. Portions of the tortuous old road are seen in the background.

Partington Canyon Bridged by Blast Making a 25,000 Cubic Yard Rockfill

By **L. H. GIBSON**, District Engineer

IN ADDITION to the many varied construction features involved or undertaken in the past several years in the building of the scenic and picturesque Carmel-San Simeon link of the Roosevelt Highway, is the rockfill roadway embankment now being placed across Partington Canyon, some 38 miles south of Carmel.

Partington Canyon is one of the many deep and narrow gorges encountered along the coast road, and where crossed by the highway now under construction is 110 feet deep and 300 feet across the top of grade elevation. The roadway fill across this gulch is the heaviest per station of any fills yet placed on the Carmel-San Simeon road, being about 135,000 cubic yards in the 300 feet across.

SOLID GRANITE LEDGE

Before crossing the canyon the road travels for a short distance along the sides of the canyon. Exactly opposite the crossing on the southerly canyon wall is a ledge of sound solid granite, one of the few ledges of sound solid rock on the entire coast project. The present or old road was blasted out of this ledge and crosses the canyon some distance upstream.

During the excavation of the old road, several thousand cubic yards of this ledge rock were blasted to the canyon below and deposited itself in large blocks in the V bottom of the canyon to a depth of about 30 feet.

Normal construction conditions at this point would have called for a large reinforced concrete arch culvert similar to the one recently constructed at McWay Canyon a short distance southerly. However, the excavating to foundation through the 30 feet of large rock tightly wedged into the canyon and the disposition of the material together with the arch construction would prove very costly, so other means of solving the drainage problem was sought.

INGENIOUS PLAN CONCEIVED

It had been observed by the Division of Highways that the rock, blasted from the present road in 1923 and lying in the canyon to a great depth, due to its large size formed a porous fill which has permitted the peak runoff of the stream for the past 15 years to pass through the interstices without overflowing the top.

It was therefore conceived that with much more of this ledge rock available when excavating for the new road that it would be advisable to raise this present rockfill some 25 feet additional and place thereon to grade elevation the ordinary roadway embankment fill material.

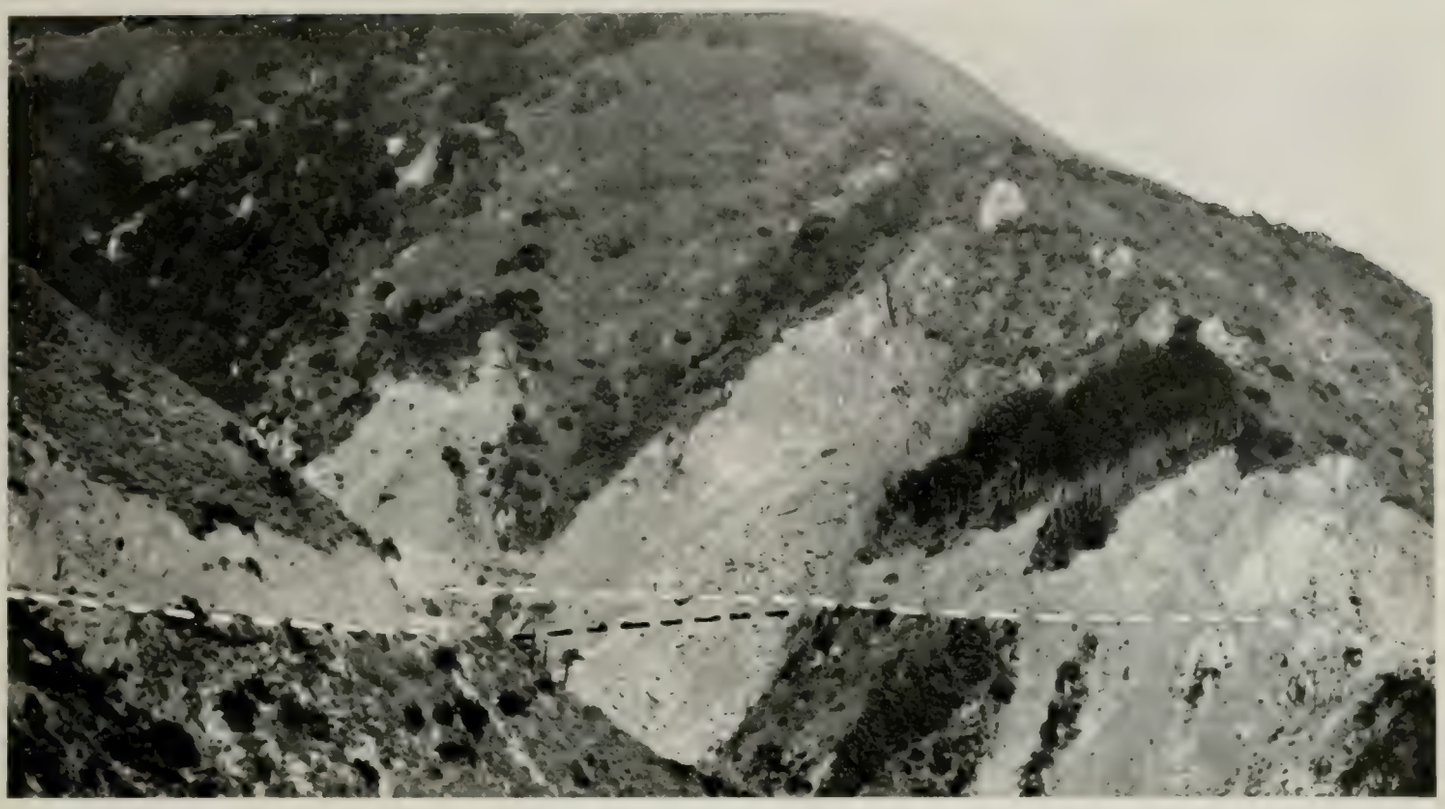
This feat could be accomplished much cheaper than placing a regular drainage structure because of the fact that the required ledge rock lay directly above the location where it was needed and a portion could be blasted into place.

On July 22, 1935, everything was in readiness to blow a portion of the ledge into the canyon below. Coyote holes had been drilled and loaded with 6500 pounds of 40 per cent powder and at 10.15 the charge was set off.

The result was entirely successful, some 25,000 cubic yards of ledge rock was blown loose, of which the majority was catapulted to position below and the balance lying on the present road and slope was broken further and moved to position.

Although the blast was by no means as large or spectacular as some previous blasts set off along the route, it was interesting from the standpoint of the purpose and the results obained, and from the material saving to the state by the method adopted in bridging this canyon in lieu of the customary expensive deep fill culvert or bridge. It is estimated that a saving of not less than $20,000 was effected by this type of construction.

Suitable rock and physical conditions are not present at any other location along the coast road where the same scheme may be followed. However, the action and behavior of this fill will be closely watched during the peak flow of the stream this winter, and if entirely successful results are obtained as anticipated a similar type of construction may be found profitable at some other location on the state highway system where satisfactory conditions for this type of construction exist.



BUILDING A FILL BY BLAST, engineers have saved the State approximately $20,000 by moving granite ledge rock into Partington Canyon on the San Simeon-Carmel highway instead of building a bridge or culvert for the highway crossing. Black dashes show proposed highway crossing at scene of blast. White ones outline the existing road.

TYPE OF PAVEMENT SURFACE HAS SMALL VISIBILITY EFFECT

As a part of the Massachusetts Highway Accident Survey in 1934, more than 5000 tests were made to determine the effect of various factors on the distance at which the driver of a motor vehicle can see a pedestrian at night.

It was found that the type of pavement surface has a relatively small effect. The average visibility distance for concrete was 304 feet, for rough macadam 295 feet, and for smooth macadam 288 feet. A small area of white, such as an unfolded handkerchief, increases the visibility distance about 50 per cent, while light colored clothing increases it about 100 per cent. At speeds above 40 miles an hour, a driver can not see a pedestrian in dark clothes in time to stop before reaching him. But if the pedestrian is equipped with reflector buttons, a driver going 60 miles per hour can see him in time to stop.

In the case of glare from passing cars, these speeds are reduced to 30 and 50 miles per hour. Even these speeds are unsafe in unfavorable weather, or with poor brakes, subnormal eyes, dirty windshield, or inattention by the driver.

Nurse: "I think he's regaining consciousness, doctor; he tried to blow the foam off his medicine."

BAY BRIDGE CENTER ANCHORAGE MAKES LARGEST "PIN-HOLE" CAMERA IN WORLD

(Continued from page 8)

The cover page this month reveals something of the beauty of the bridge at night.

Since the beginning of San Francisco, Yerba Buena Island has seemed a part of the city by the Golden Gate. But it was only a few days ago that the island and the mainland were actually connected for the first time within the memory of man. The placing of the catwalk ropes between the concrete center anchorage in the middle of the bay and Yerba Buena has been completed. Soon the aerial illumination of the bridge will extend from San Francisco to the island adding to the night beauty of the bay.

CALIFORNIA NATIONAL FORESTS GET $1,116,263 FERA FUNDS

Providing funds for a variety of projects in the eighteen national forests of California, $1,116,263 has been distributed among the various areas, according to a statement by Regional Forester S. B. Show. The money has been made available to the Forest Service by the Federal Emergency Relief Administration. Projects will include forest trails and roads other than highways and county roads; fire prevention and control; and development of fish and game resources.

Storm Period Kept Snow Crews Busy On 4500 Miles of Highway Last Winter

SNOW removal is one phase of highway maintenance work that stands out with dramatic effect against the routine procedure of ordinary upkeep entailing, as it does, hardship and perils for the snow plow crews that resulted in serious accidents and one fatality this past winter.

During the storm period of this year, it was necessary to remove snow from 4500 miles of road as compared with about 3300 miles during a normally heavy storm.

Four inches of snow fell at Eureka, where even a trace of snow is seldom seen; and on Oregon Mountain in Del Norte County, a location where snow removal is usually a minor matter, there was a fall of 104 inches. Similar conditions obtained throughout the entire snow area.

101 INCH SNOW PACK

The record of total snow fall and of solid pack at Donner Summit for four winter seasons, as shown by the following tabulation, is of interest.

Season	Total fall in inches	Total packed snow Inches	Date
1931–32	544	60	April 16
1932–33	422	29	April 16
1933–34	262	0	April 16
1934–35	505	101	April 16

The extended storm period and severe nature of the storms placed a severe strain on men and equipment. In some cases, the equipment was operated continuously for 175 hours with only sufficient time out for servicing.

The theory of successful snow-removal is to start work with the beginning of the storm and continue operations until the storm ceases and the roads are clear. The work is planned to provide three full crews for each 24-hour period. When the exceptional storm occurs, the crew reliefs can not always be arranged on time.

REGARDLESS OF HOURS

Frequently the men took the equipment out this winter and kept it moving until relieved or until a round trip was made, regardless of the hours worked. While the work is hard, it is found the men take a special pride in seeing the job through.

The main interstate connections on which snow removal was required this season are as follows:

Routes	Snow removal sections
Redwood Highway, U. S. 101	Crescent City to State line
Pacific Highway, U. S. 99	Dunsmuir to State line
Weed-Klamath Falls U. S. 97	Weed to State line
Alturas Lateral, U. S. 299	Redding to Alturas
Susanville Lateral	Red Bluff to State line
Donner Summit Route, U. S. 40	Colfax to State line
East of the Sierras, U. S. 395	Bishop to State line, and Johnstonville to Oregon State line at New Pine Creek via Alturas
Tehachapi Route, U. S. 466 and U. S. 91	East of Bakersfield to Mojave and vicinity Mountain Pass near Nevada State line
San Diego to Yuma, U. S. 80	In vicinity of Jacumba

The Division of Highways had in service some 160 snow plows, ranging from the straight-blade push plows for use with trucks or tractors, the one-way speed plows for use with trucks, and from the "V"-type to the rotary plows used for opening roads and as widening units.

METHOD OF SNOW REMOVAL

On snow-removal work, the straight-blade push plows are started out at the beginning of the storm, windrowing the snow to the side of the road. In the event the road becomes blocked by drifts too deep for the push plows to handle, the "V" plows are used to break through.

When the road can not be opened by either the straight blade or "V"-type plow, the rotary plows are used.

The extent of winter use, with one or two exceptions, has well justified the expenditures for snow-removal work, which amount to from $300,000 to $350,000 in a normal season. The Donner Summit Route, for instance, now carries an average of 500 vehicles daily from November 15 to April 1, a period during which the road was formerly closed.

Landscaping Protected in Road Work

(Continued from page 18)

tance and therefore the safety of the route for the motoring public. In order to increase the width and improve the highway grade on this steep sidehill country it was necessary to change the grades of many of the intersecting streets where they joined the new highway The city officials of Laguna Beach cooperated to the fullest extent in making the necessary changes of grade for the city streets.

The widening of the highway made connection with intersecting streets so difficult in places that at the east end of Victoria drive, a combination vehicular and pedestrian subway was constructed to carry this drive under the highway to make a safe connection. Construction of this subway made it possible to do away with the old unsightly timber overhead pedestrian bridge located somewhat westerly of the new subway.

SECONDARY ROAD NECESSARY

Just westerly of the new subway, the widening was through a deep cut. The property on the north side of the highway along this portion of the new road is at a considerably higher elevation than the roadway so that access to the property was formerly had via a side road paralleling the highway at a higher elevation and immediately adjacent thereto.

Work of widening the highway completely cut away this existing side road, making it necessary to construct a secondary road located farther back but in general paralleling the highway. The east end of this secondary road terminates at the portal of the Victoria drive subway.

The new improvement project connects at the south city limits of Laguna Beach with a 30-foot pavement on an 80-foot grade, which was constructed during the winter of 1932-1933. At Cypress street, the northwesterly end of the recently completed contract connects with a 56-foot pavement through the business section of Laguna Beach, which was constructed about 8 years ago. This 56-foot pavement in turn connects at Cliff drive with a 72-foot pavement, which extends to Myrtle street, and from this point a 40-foot pavement on an 80-foot grade was built under state contract three years ago to the west city limits.

Under this same contract a 30-foot pavement was constructed on an 80-foot roadbed to Corona Del Mar. Thirty feet is the present standard width of pavement on the Coast highway except through congested districts.

PROVIDES CONTINUOUS IMPROVEMENT

With the completion of this improvement there is provided a continuous highly improved highway from Long Beach along the coast to Doheny Park, where junction is made with State Highway Route No. 2 leading to San Diego.

The city of Laguna Beach cooperated with the state by agreeing to the use of the entire quota of gas tax funds accruing to the city during the last biennium for this improvement.

Laguna Beach, a community with a large colony of artists and writers, has many beautiful homes with extensive landscape work on the grounds. In widening the highway particular care was taken to preserve existing landscaping effect and add, if possible, rather than detract from the appearance of the work already done by private individuals. The fact that the Division of Highways has succeeded in attaining this end is attested to by numerous letters from private individuals and expressions of appreciation from civic bodies.

ALAMEDA COUNTY LEADS IN STATE TRAFFIC DENSITY COUNT

Alameda heads the list of California counties in the matter of the average daily count of 1652 vehicles per mile of State highway and little Modoc is last with 34 vehicles per mile, according to the road transportation survey of the Division of Highways.

A summary of data on vehicle density reveals that on 95,957 miles of State roads and city streets a total annual travel of 6,600,000,000 vehicle miles is divided as follows: 47 per cent on urban and rural State highways; 11.5 per cent on county highways, and 41.5 per cent on city streets other than State highways.

Foreman (to workman)—"Now then, Bill, what about carrying up some more bricks?"

Bill—"I ain't feelin' well, boss; I'm trembling all over."

Foreman—"Well, get busy with the sieve, then."

Highway Bids and Awards for the Month of July

(Continued from page 22)

Angeles, $10,414. Contract awarded to Morgan Bros., Huntington Park, $9,818.25.

SAN FRANCISCO-OAKLAND BAY BRIDGE—Electrical work of San Francisco-Oakland Bay Bridge and its highway approaches. Ne Page-McKenny & Kenney Bros. Co., San Francisco, $445,845; Radelfinger Bros., San Francisco, $458,415; Newbery Electric Corporation, Los Angeles, $509,586; Clinton Construction Co., $498,300; Bridge Builders, Inc., Oakland, $647,777; C. C. More & Co., Engineers, San Francisco, $648,929. Contract awarded to Alta Electric and Mechanical Company, Inc., and American Building Maintenance Company, San Francisco, $442,939.

SAN FRANCISCO-OAKLAND BAY BRIDGE—Administration Building and Toll Plaza. Contract awarded to Clinton Construction Co. of California, San Francisco, $360,857.

SAN LUIS OBISPO COUNTY—Various locations to be treated with liquid asphalt about 34.2 miles. District V, Routes 33, 125, 58, Section D E, A, AB. James S. Butler, San Luis Obispo, $13,775. Contract awarded to L. A. Brisco, Arroyo Grande, $11,672.50.

SAN LUIS OBISPO COUNTY—Between Morro and Atascadero, new property fence to be constructed and existing fence to be removed. District V, Route 125, Section A. Theo. M. Maino, San Luis Obispo, $3,385; James S. Butler, San Luis Obispo, $3,610; Walter B. Roselip, San Luis Obispo, $3,775; J. R. Reeves, Sacramento, $4,870. Contract awarded to L. A. Brisco, Arroyo Grande, $3,003.75.

SANTA CRUZ COUNTY—In the City of Santa Cruz, Ocean Street, between Pryce and Water Streets. District IV, Route 5, Section S.Cr. Resurface with natural rock asphalt, about 0.4 mile. Union Paving Co., San Francisco, $6,365; Pacific States Construction Co., San Francisco, $7,392. Contract awarded to Lee J. Immel, Berkeley, $5,490.

SHASTA COUNTY—Between Route 28 and Four Corners and that portion within McArthur Memorial Park, about 8.1 miles in length. To be treated with liquid asphalt. District II, Route 83, Section D. Tiffany Construction Co., San Jose, $3,348; C. F. Fredericksen & Sons, Lower Lake, $3,408; Hayward Bldg. Materials Co., Hayward, $4,725. Contract awarded to E. F. Hilliard, Sacramento, $3,080.70.

SISKIYOU COUNTY—Between 0.4 mile east of Mt. Hebron and Dorris, Class "B" Seal Coat to be applied. District II, Route 72, Section C. A. Teichert & Son, Inc., Sacramento, $12,909. Contract awarded to Dunn & Baker, Klamath Falls, Ore., $9,975.

SISKIYOU COUNTY—Between Cougar and 4 mi. NE. of Grass Lake station, about 8.2 miles to be graded. District II, Route 72, Section B. N. M. Ball & Larsen Bros., Berkeley, $147,904; Bayshore Construction Co., Inc., San Francisco, $154,248; Peninsula Paving Company, San Francisco, $163,081; A. Teichert & Son, Inc., Sacramento, $181,965. Contract awarded to Dunn & Baker, Klamath Falls, Oregon, $148,542.

SONOMA COUNTY—Between College Avenue and the south city limits about 1.2 miles to be widened and paved with Portland cement concrete and asphalt concrete. District IV, Route 1, Section S. Ro. Hanrahan, Wilcox Corp., San Francisco, $77,891; Fredrickson, Watson Const. Co., Fredrickson Bros., Oakland, $71,060; Pacific States Const. Co., San Francisco, $62,-628; Heafy Moore Co., Oakland, $76,152; A. G. Raisch, San Francisco, $61,234; Peninsula Paving Co., San Francisco, $68,850. Contract awarded to Union Paving Co., San Francisco, $59,869.70.

STANISLAUS COUNTY—Between 0.8 mile north of Newman and 0.2 mile south of Crows Landing—about 4.5 miles to be graded and road mix surface to be placed. District X, Route 41, Section B. A. Teichert & Son, Inc., Sacramento, $109,832; M. J. B. Construction Co., Stockton, $108,729; Central States Contracting Co., Ltd., Oakland, $114,235; Earl W. Heple, San Jose, $101,486; Hanrahan-Wilcox Corporation, San Francisco, $99,451; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $108,203; Biasotti, Willard & Biasotti, Stockton, $97,067. Contract awarded to Union Paving Co., San Francisco, $95,-324.20.

TULARE, FRESNO COUNTIES—Between Visalia and Orange Cove (Tul-Fre-132, B, C & A), between Visalia and Woodlake (Tul-133-A), about 34.9 miles shoulders to be road-mix surface treated. District VI, Routes 132, 133, Section B C, A. E. A. Forde, San Anselmo, $13,850; Stewart & Nuss, Inc., Fresno, $15,-173; Basich Brothers, Torrance, $15,380; A. Teichert & Son, Inc., Sacramento, $17,767; John Jurkovich, Fresno, $16,620; Oilfields Trucking Co., Bakersfield, $15,028. Contract awarded to Clyde W. Wood, Stockton, $12,930.

District Engineers Empowered to Issue Overweight Permits

DELAY, inconvenience, and expense attached to the obtaining of a permit to operate overweight vehicles on state highways are done away with in an order recently issued by State Highway Engineer C. H. Purcell of the Department of Public Works.

This order has vested in district highway engineers sole authority for the issuance of all single transportation permits within a given highway district and they, in turn, may delegate this power to maintenance superintendents when deemed advisable. Headquarters approval no longer will be required for such permits.

The new order means that persons desiring emergency permits for the operation of overweight trucks, steam shovels, machinery, etc., over state highways will not have to travel long distances to headquarters offices to obtain them.

"It must be borne in mind," says Mr. Purcell in the general order to district engineers, "that section 91 of the 1933 Vehicle Act authorizes permits to operate otherwise illegal vehicles and/or loads in emergencies, and was not intended to provide a means for evading the law by indiscriminate issuance of permits.

A growing tendency by manufacturers and others to assemble vehicles with illegal features should be discouraged wherever the occasion arises, and contract carriers must not obtain the impression that general hauling of overloads will be tolerated under permit when other means of transportation are available. District engineers will be held strictly accountable for the proper administration of this authority, and employees designated to handle this work should be impressed with their limitations and responsibilities in order that a uniform policy is maintained."

"They say you married her because her aunt left her a fortune."

"That's not true—I would have married her no matter who left her the dough."

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

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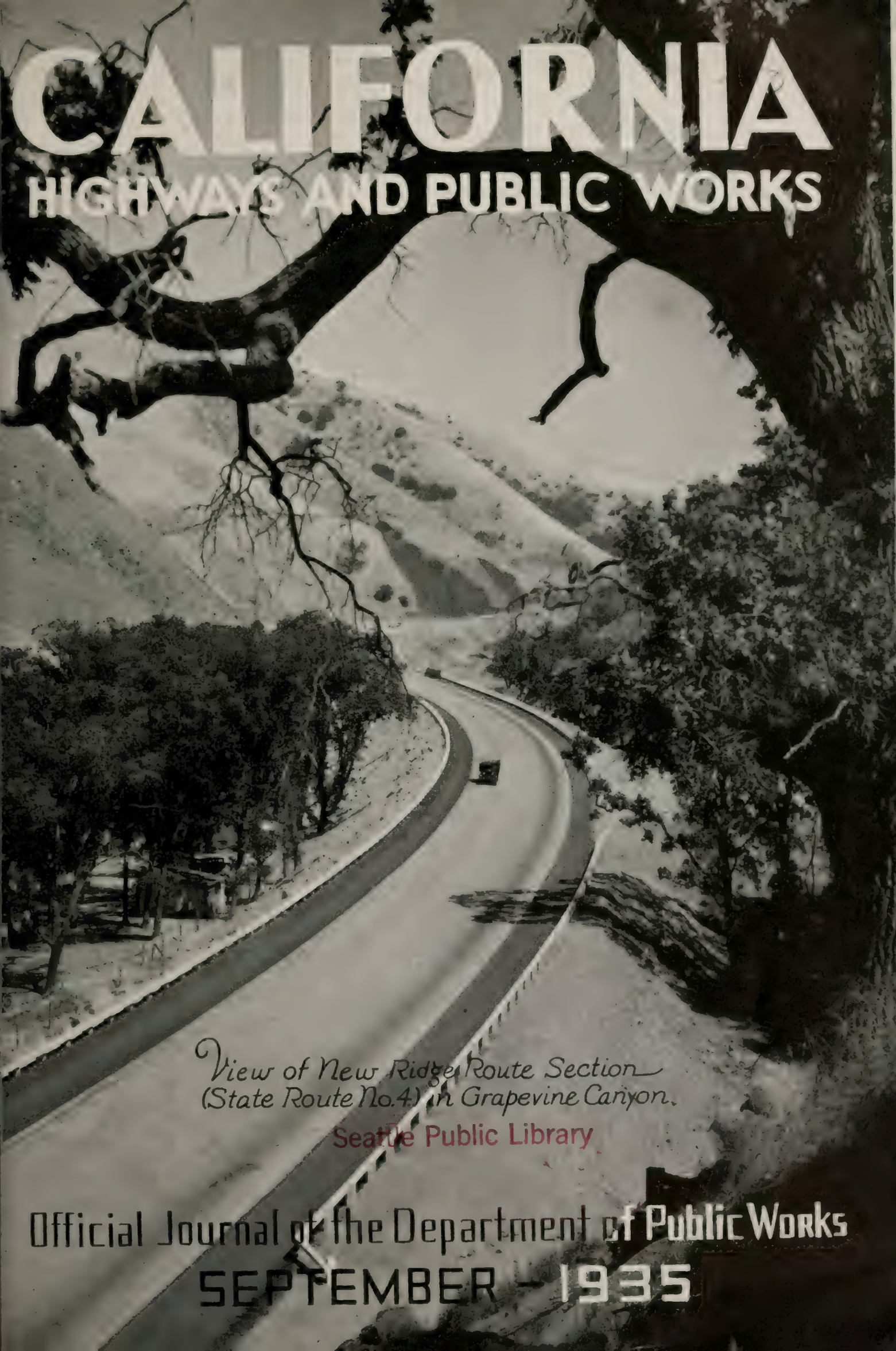

View of New Ridge Route Section (State Route No. 4) in Grapevine Canyon.

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Official Journal of the Department of Public Works

SEPTEMBER - 1935

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$21,545,370 for Highway

Construction of Major Projects

In Revised Budget

For 87th and 88th Fiscal Years

By **JULIEN D. ROUSSEL**, Secretary California Highway Commission

THE revised State highway budget for the 87th and 88th fiscal years, July 1, 1935, to June 30, 1937, as adopted by the California Highway Commission and presented to Governor Frank F. Merriam for approval by Chairman Harry A. Hopkins provides $21,545,370 for major project construction throughout the State during the biennium in comparison with $26,498,980 set up in the original budget adopted by the Commission December 27, 1934.

JULIEN D. ROUSSEL

The revised budget was approved and made public by Governor Merriam September 12th and in an accompanying statement he said that despite the necessity of reducing proposed expenditures by some $6,000,000 in consequence of the act passed by the last Legislature increasing the allocation of gasoline tax funds to municipalities by approximately that amount, it made him very happy to be able to announce that in all important essentials the program for improvement of State highways remains practically as originally compiled.

The Commission accomplished this happy result by several means. First, by underwriting the entire Federal relief program allocated to the State which enabled the Commission to apply on State highway projects about $3,860,000 of the $7,747,928 Federal Works Progress road funds apportioned to California, thereby releasing State funds for retention of programmed projects;

Second, by applying on State highway construction projects within cities approximately $1,690,000 of the ¼ cent allocation made by the Legislature, and third, by reduction of certain projects and elimination of several less important projects, improvement of which will be deferred until the next biennium.

The allotment to the State under Federal Emergency Relief Apportionment Act of 1935 was predicated primarily upon the use of 90 per cent of labor from relief rolls and on the basis that the amount paid from Federal funds would be limited to $1,400 per man-year on every approved project. The cost of highway projects in California average $3,000 per man-year including engineering, materials, transportation, supplies, equipment and necessary incidentals thereof.

By arrangement with the Federal government the State has agreed to underwrite the man-hours of labor which would be produced by the Federal allotment, selecting a program of projects subject to approval of the U. S. Bureau of Public Roads, the Works Progress Administration and the National Emergency Council.

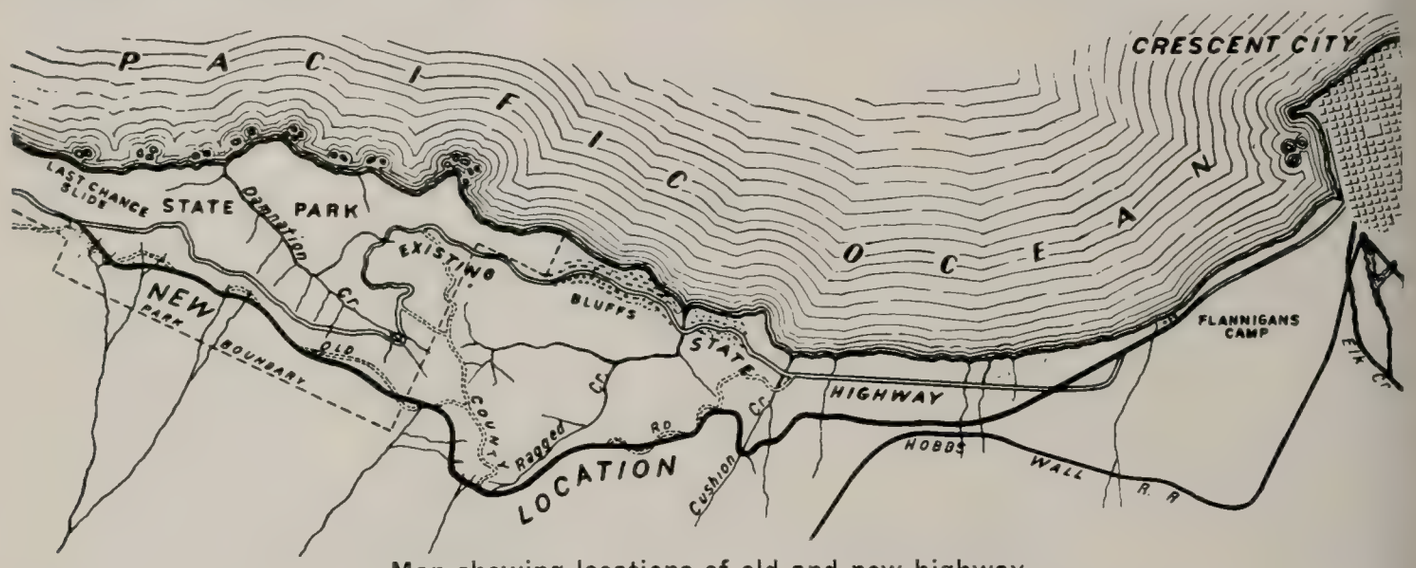
(Continued on page 8)

Two States Join in Dedication of Relocated Redwood Highway Sector

WITH picturesque pageantry in which present day leaders of California and Oregon joined with descendants of early pioneers, costumed Indians and Oregon "cavemen," the recently completed sector of the Redwood Highway (State Route No. 1) in Del Norte County, south of Crescent City, was formally dedicated on Sunday, August 18th.

The reconstruction of this nine mile sector between Last Chance Slide and Flanagan's saves eight-tenths of a mile in distance and eliminates 205 sharp and dangerous curves totaling 9557 degrees of curvature or about twenty-six and one-half complete circles.

The savings to motorists in operating costs, conservatively estimated at thirty cents per vehicle trip and based on present traffic count figures, will amortize the entire construction cost of $725,000 in slightly less than ten years.



Map showing locations of old and new highway

THREE CARAVANS ARRIVE

Under clear blue skies, along the shores of the Pacific just south of Crescent City, three caravans arrived at the dedication "barrier" —one from Klamath, which drove through groves of Giant Redwoods over the new sector; another from Grants Pass, Oregon, and another from Smith River, on the Del Norte Coast Highway.

The barrier was in the form of two massive gates—colorfully decorated with redwood boughs, dahlias and other native flowers of Del Norte County, tied together with a buckskin thong.

When Chief Robert Spott, Klamath Indian, severed the buckskin thong with a century-old Indian flint-knife, the gates were opened by the chief and his fellow tribesmen, together with Miss Redwood Empire (Jean Griffin), Miss Del Norte County, an Indian princess (Evelyn McDonald), Miss Crescent City (Lora Childs), Miss Smith River (Jean Sanford) and Miss Klamath (Margreta Crone).

PROGRAM ON BEACH

The Grants Pass Municipal Band, which headed the Grants Pass Caravan, then led the combined caravans into Crescent City under direction of Grand Marshall H. G. Ridgway, Chairman Events Committee, Redwood Empire Association. Marshal for the Grants Pass Caravan was W. M. Moses, representing Grants Pass Chamber of Commerce and the Smith River Caravan was led by President William Buckner of Smith River Chamber of Commerce.

At Crescent City the official party was tendered a complimentary luncheon by the Del Norte County and Crescent City Chambers of Commerce.

The formal dedication program followed—on the beach at Crescent City, adjacent to the Ocean Drive. The speakers' stand was beautifully decorated with redwood boughs and flowers by the various womens clubs of

(Continued on page 18)

JOINING HANDS AT THE BARRIER, Deputy Director Edward J. Neron of the California Department of Public Works, representing Governor Frank F. Merriam, and Senator John D. Goss of Oregon, representing Governor C. H. Martin of that State, exchanged congratulations on the dedication of the new section of the Redwood Highway south of Crescent City. Deputy Director Neron is at the microphone. Bottom pictures show portions of the new highway through the Redwood forest and along the coast.

M Street Bridge Spans 95 per cent Complete; Opening Set for November

By **G. W. THOMPSON**, Resident Engineer

THE M Street Bridge across the Sacramento at the foot of M Street in Sacramento is rapidly nearing completion and will soon provide an adequate and impressive highway entrance into the Capital City from the west.

The new bridge will accommodate two lanes of highway traffic in each direction with a single railroad track in the center. Concrete curbs on each side of the railroad protect the highway traffic. In addition, there is a four foot clear width sidewalk on each side of the bridge to carry pedestrian traffic. A heavy guard rail made of steel protects the pedestrians from highway traffic and an ornamental steel handrail is placed on the outside.

The two center piers supporting the approach span and lift span are set on large concrete blocks part of which were poured under water. Their total height is some 84 feet of which 40 feet is below the river bottom. They rest upon a foundation of gravel and boulders. Since these two piers flank the main river channel, they will be protected from barges and steamers by heavy creosoted pile fenders.

PIERS AND ABUTMENTS PLACED

Foundation for the rest of the piers and abutments consists of either Douglas Fir piling or reinforced concrete piling. The general contractor has recently completed the placing of the east and west abutments and west approach piers of which there are three. These piers and abutments, together with the main river piers, supporting the steel structure are now complete.

The superstructure consists of four short steel stringer spans, a 225 foot and 167 foot steel truss span, a 202 foot steel truss lift span which provides for a 97 foot vertical clearance above extreme high water, and a short combination reinforced concrete girder and steel stringer span connecting the front and rear wall of one of the end abutments, making a total length of about 738 feet.

The two approach spans, the lift span, and the lift span towers which rise to a height of 160 feet above the lower chord, are now 95 per cent erected and riveted. The towers will be the fourth highest structures in the city and will be covered with a sheet metal giving them a modernistic and imposing appearance. The entire steel structure is to be given a final coat of aluminum paint.

LIGHT WEIGHT CONCRETE

The deck and sidewalk of the steel spans and west approach stringer spans will be of lightweight concrete weighing under 100 pounds per cubic foot as compared to 150 pounds per cubic foot for ordinary concrete. This amounts to a saving in weight of 33 per cent and allows for a great saving in steel in the design of the steel trusses.

Some of the aggregate going into the concrete is so light that it will actually float on water, but the strength of the concrete made from it is little less than is obtained from the use of standard aggregates. A thin layer of topping is also placed for wear and finishing. Placing of this concrete is now in full swing with two spans complete.

Inside each tower and hanging by cables passing over large sheave wheels and connected to the lift span is a large steel box to be filled with concrete to balance the weight of the lift span so that raising and lowering of the span might be accomplished with much more ease and less power.

HEAVY BALANCE CHAIN

A large balance chain resembling a bicycle chain but weighing 515 pounds per lineal foot hangs from the counterweight box and is connected to the tower. This chain is so designed that the weight of the counterweight cable in passing from one side of the tower to the other as the lift span is raised or lowered will always be balanced by this chain.

Power for raising the bridge is supplied from two sources. The main motors are two one hundred horse power electric motors and the auxiliary motor is a sixty-seven horse power gas motor. Both sources of power are connected to the main gear box and hoisting drums. All switch boards, controls, and motors are located in the machinery house situated on top and in the center of the lift span.

An elaborate system of signals, sirens, bells, and gates has been developed as a precaution to safeguard the traveling public.

(Continued on page 22)

NEARING COMPLETION, the M Street bridge over the Sacramento River at the State capital is pictured with the 202-foot steel truss lift span in raised position still partially supported by false work.

CONSTRUCTION VIEWS of the tall massive looking lift towers rising 200 feet above the water and the rugged steel deck spans that provide a 52-foot roadway.

State Highways Extensively Damaged by August Storms in Several Districts

A storm period that covered practically the entire State during the last days of August did an unusual amount of damage to the State highways for a late summer storm in Siskiyou, Alpine, Sonora, San Bernardino, Riverside and San Diego counties. Large sections of roadway were washed out, or covered with mud and debris, bridges and drainage structures were broken and automobiles wrecked but without loss of life and in every instance State maintenance crews were able to open the roads to traffic within a few days. The most extensive cases of damage are described in the following reports:

BY E. E. WALLACE
District Engineer, District XI

SINCE the early settlement of the Palo Verde Valley along the Colorado River in the vicinity of Blythe, and the Coachella Valley north of the Salton Sea, until the completion last June of the Indio Cut-off from Indio to Shaver's Summit, the only means of travel between the two valleys in Riverside County on State Highway No. 64 has been through Box Canyon, a narrow rift in the sandstone mountains extending from a point about six miles west of Mecca for a distance of ten miles to the mesa at Shaver's Summit.

During the cloudburst season which occurs from July to October, travel through this canyon has been fraught with danger from the hazards of flood waters which pour through the canyon from a drainage area of over 400 square miles.

COSTLY BIT OF ROAD

Records show numerous floods have delayed light traffic and stopped all heavy trucking in the canyon for various lengths of time. In September, 1929, the road was completely obliterated and trucks and cars caught in the waters were buried and lost. The road was immediately rebuilt and maintained as a dirt road until November, 1933, when the surface was oiled. Numerous small floods occurred during the fall of 1934 which inconvenienced and delayed traffic and made the maintenance of this section very costly.

During the early morning of August 23, 1935, extremely heavy rains fell over the slopes of the mountains both to the south and north of the road between the canyon and Shaver's Summit. The rain started at 4.30 a.m. and had reached the canyon about an hour later, at 5.30 a.m. The flood reached its peak almost immediately and rushed down the gorge in varying depths from 18 inches to six feet, depending upon the width of the canyon floor. Seven miles of highway were destroyed.

TWO-HOUR FLOOD

It required about one hour for the crest to reach the foot of the canyon. The flow from the upper end was also supplemented by a heavy run-off from Wide Canyon, a tributary draining south from about the middle of Box Canyon. The flow continued for about two hours. Maintenance crews were at the scene of trouble almost immediately after the flood and entered the canyon to render assistance as soon as the waters had subsided sufficiently to permit.

For the past year there has been a tent settlement, at Shaver's Well, of employees from the Metropolitan Water District Project. This was completely wiped out, with the exception of two or three tents and house-trailers which were located on higher points. Approximately eight cars were lost, and two freight trucks were damaged. No lives were lost, one injury was reported and in numerous cases people swam or were washed to safe points.

SHAVER'S WELL ABANDONED

The store at Shaver's Well was ruined, the well caved in and at present the place is being abandoned and the remains of the buildings being moved to other locations. This means a loss of an old landmark, dating back to the days of freighting with mules and wagons.

The proprietor stated that from his past experience he was certain that many lives would have been lost but for the fact that traffic was using the new Indio Cut-off and was not concentrated in the canyon. Due to the new Indio Cut-off, no interruptions whatever occurred to through traffic.

(Continued on next page)

WIPED OUT. Scenes in Box Canyon, Riverside County, where 7 miles of highway on old State Route 64 were destroyed by flood waters August 23d. At bottom, two of eight cars that were wrecked.

(Continued from preceding page)

This being a bond act road, it will be necessary to rebuild it. This section of road is being reconditioned so that it will be traversable. It will require approximately 60 days work and the expenditure of $15,000.

In the meantime traffic is being handled over the Indio Cut-off, with no inconvenience whatever, except to a small amount of local traffic originating in the territory around Mecca.

(Continued on page 26)

$21,545,370 in Revised Highway Budget for 87th-88th Fiscal Years

(Continued from page 1)

GREATER EFFICIENCY SECURED

By this underwriting program the State is permitted to apply the Federal funds in practically the same manner as on ordinary or regular State funds improvements, and thus secure greater efficiency by not being obliged to depend entirely on hand labor methods. The State must, however, employ the required number of man-hours of labor from relief rolls and this will be accomplished by spreading relief labor to a number of State financed projects.

As a result of these adjustments, the $26,498,980 set up in the original budget for major project construction throughout the State, less the ¼ cent allocated for cities is reduced to $21,545,370, the amount now available for major project construction throughout the State.

DIVISION NORTH AND SOUTH

Of this amount, $11,805,290 is for the north 45 counties and $9,740,080 for the south group of thirteen counties as apportioned under the provisions of the Breed act and amendments. Projects totaling these amounts are listed in the program.

The total major projects on State highways throughout the State number 126 including 16 projects on State highways in cities.

SEPERATE FEDERAL BUDGETS

Separate budgets are under preparation for the Federal grade separation program of $7,486,362 and the Federal Emergency apportionment of $7,747,928 for highway work. The latter program, as submitted to the Federal agencies, includes 33 projects on the State highway system approximating 40 per cent of the road funds; the remaining 60 per cent is distributed approximately equally between county feeder roads and to projects within cities according to Federal requirements and regulations.

The grade separation program is made up of important projects for railroad and highway crossings on city streets, county roads and State highways. Both of these programs require approval of three Federal agencies before they can be published or any work can be undertaken.

DETAILS OF PROJECTS

The complete details of the major construction projects in the State highway budget and the allocations made for them, based on estimated costs, are given in the following tabulations:

STATE NOT CONFINED TO USE OF RELIEF LABOR ON ROADS BY NEW U. S. RULING

BY EARL LEE KELLY, DIRECTOR OF PUBLIC WORKS

President Roosevelt has approved granting the California State Department of Public Works the right to use other than relief labor on California highway projects financed with the aid of Federal funds whenever such relief labor is not available.

I have received a communication from the United States Bureau of Public Roads informing me of the signing of these amendments to the rules and regulations governing highway construction by Acting Secretary of Agriculture Tugwell and of their approval by President Roosevelt.

The significance of this change in the regulations relative to labor employment means that the Waldo Approach to the north end of the Golden Gate Bridge; Palomar Road, San Diego County; and other important feeder road projects apparently can be financed under Federal Aid.

While the original clause stipulating the use of relief labor only was included as a Federal requirement in such work, the State Department of Public Works did not dare to undertake the projects referred to above for fear that relief rolls might become depleted before the completion of the work, thereby causing the government to discontinue Federal Aid.

We now look forward to the granting of our application for the financing of these improvements upon a basis which we can accept. The amendment approved by the President requires the contractor to employ only persons certified for assignment to work by the U. S. Employment Service with preference in employment being given to persons from public relief rolls when they are qualified for the work.

The amended regulations relieve the State from the original mandatory provision of obtaining all the required labor from those on relief whether qualified for the work or not.

"I understand you've got your divorce, Mandy. Did you get any alimony from your husband?"

"No, Mrs. Jones, but he done give me a first-class reference."—*Elks Magazine.*

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS

PRIMARY NORTH

County	Route	Location	Approximate mileage	Nature of improvement	Estimated cost: Detail	Estimated cost: Total
Humboldt	1	Salmon Creek to Bucksport	7.3	Grading and surfacing	$165,000	
Mendocino	1	Outlet Creek to Reeves Creek	4.5	Grading and surfacing	196,000	
Humboldt	1	Trinidad to McNeil	2.1	Grading and surfacing	125,000	
Mendocino	1	Eleven Oaks Road to Willits	0 8	Grading, surfacing, bridge	60,000	
Del Norte	71	0.7 miles south of State line to 0.5 miles north of Winton Corner	5.1	Grading and surfacing	140,000	
Nevada-Placer	37	0.5 miles west of Soda Springs to Donner Summit	....	Grading and drainage	53,500	
Tehama	29	Route 3 to 1.5 miles east of Dales	13.8	Surfacing	175,000	
Shasta-Lassen	28	Fall River Mills to Nubieber	20	Surfacing	43,000	
Shasta	20	Near Shasta to near Redding	5	Grading and surfacing	220,000	
Tehama	7	Richfield to Red Bluff	13	Grading and paving	270,000	
Plumas-Butte	21	Jarboe Gap to Keddie (portions)	....	Grading (prison labor)	992,000	
Butte	3	Biggs Road to Chico	19	Grading and surfacing	95,000	
Yolo-Colusa	7	Dunnigan to Arbuckle	8.9	Grading and surfacing	180,000	
Yolo	6	Causeway to M Street Subway	3.5	Grading and paving	170,000	
Yuba-Sierra	25	Nevada City to Downieville (portions)	.....	Grading and surfacing	75,000	
Nevada-Sierra	38	Floriston to State Line	5	Grading and surfacing	50,000	
Sacramento	3	Sacramento to American River	0.3	Grading and paving	50,000	
Santa Cruz	5	Scott Valley to 1 mile north of Santa Cruz	3.9	Grading and surfacing	220,000	
Santa Clara	68	Santa Clara-Alviso Road to San Jose	3.7	Grading, paving, bridge	425,000	
Marin	1	Waldo to Golden Gate Bridge	3.5	Grading, paving, structures	500,000	
Monterey	2	Soledad to Gonzales	8.0	Grading and paving	158,000	
Monterey	2	Thompson Gulch	.....	Grading and paving	27,000	
Fresno	4	Fresno to Ashlan Avenue	4.0	Grading and paving	275,000	
Kings	10	1.5 miles east of Hanford to Hanford	1.5	Grading and paving	60,000	
Solano-Napa	7-8	1 mile north of Carquinez Bridge to Cordelia	11.2	Grading and paving	445,000	
Solano	7	3.5 miles north of Fairfield to 0.6 miles south of Vacaville	3.8	Grading, paving, bridge	202,000	
Stanislaus	4	Turlock to Esmar	6.0	Grading and resurfacing	50,000	
Santa Clara	2	State's share Alameda Grade Separation SPRR	.....	Structure (amount due Railroad Co.)	75,000	
Glenn	7	From 4 to 5 miles north of Willows	1.1	Grading, paving, bridge	44,000	
Monterey	2	Bradley to 6 miles south of San Ardo, Hames Creek	6.8	Grading, paving, bridge	335,000	
.....	.....	Landscaping (Federal Aid Routes)	....	.....	53,540	
Subtotal						$5,929,040

CITY PROJECTS

County	Route	Location	Approximate mileage	Nature of improvement	Available: From ¼ cent allotment	Available: From regular budget	Available: Total
Humboldt	1	Eureka: Broadway from south city limits to Wabash Avenue	1 4	Grading and paving	$16,900	$43,100	
Sutter	3	Yuba City: Plumas Street from Sumner to Rio Camino	0.5	Grading and paving	3,000	22,000	
San Francisco-Alameda	5-68-69	San Francisco, Oakland, Emeryville, Berkeley: Bay Bridge approaches		Grading, paving, structures		3,300,000	
Total and subtotal					$19,900		$3,365,100
Grand total, Primary North							$9,294,140

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS—PRIMARY SOUTH

County	Route	Location	Approximate mileage	Nature of improvement	Estimated Cost	
					Detail	Total
Santa Barbara	2	Tajiguas Creek to 1½ miles west of Arroyo Hondo	3.2	Grading and paving	$203,000	
Santa Barbara	2	1 mile north of Rincon Creek to Carpinteria and Carpinteria Creek Bridge	1.6	Grading, paving, bridge	125,000	
Santa Barbara	2	Richfield Tower to Santa Maria River	1.5	Grading and paving	65,000	
Santa Barbara	2	Sheffield Drive to Olive Mill Road	1.6	Grading and paving	110,000	
Kern	4	South Boundary to Fort Tejon and Cuddy Creek	5.2	Grading, paving, bridges	440,000	
Kern	4	Famosa Grade Separation approaches and Poso Creek Bridge	1.0	Grading, paving, bridges	60,000	
Tulare	10	Yokohl to Lemoncove	5.0	Grading and surfacing	150,000	
Los Angeles	9	Verdugo Road to Flintridge Country Club	1.4	Grading and paving	150,000	
Los Angeles	9	Pickens Canyon Wash		Bridge	12,500	
Ventura	2	Conejo Grade and Conejo Creek	7.0	Grading, paving, bridge	550,000	
Los Angeles	2	Calabasas to Conejo Grade (portions)		Grading and paving	200,000	
Los Angeles	4	Newhall Tunnel		Grading and paving	100,000	
Ventura	60	Oxnard to Hueneme Road	4.9	Grading and paving	73,000	
Ventura	60	Big Sycamore Creek and line change	1.0	Grading, paving, bridge	150,000	
Orange	60	Seal Beach to Newport Beach	10.3	Grading and paving	150,000	
Orange	60	The Arches Grade Separation Routes 60 and 43		Structure, grading, paving	180,000	
Los Angeles	23	Lancaster to North Boundary	10.0	Pavement widening	50,000	
Los Angeles	4	Through Newhall (County Coop. $31,000)	0.7	Grading and paving	15,000	
Riverside	26	North Boundary to Beaumont	1.5	Grading and paving	77,000	
San Bernardino-Riverside	19	Ontario to Riverside	15.0	Grading and surfaced shoulders	40,000	
San Bernardino	26	Santa Ana Road to Redlands, Mission Storm Drain	5.5	Grading, paving, structure	111,000	
San Bernardino	58	In Barstow		Grading and surfacing	35,000	
San Bernardino	58	Ludlow to 20 miles east of Amboy		Drainage, grading, bridges	20,000	
Inyo	23	Big Pine to Keough Hot Springs	8.0	Grading and surfacing	150,000	
Mono	23	2 miles south of Rush Creek to 3 miles south of Mono Inn	7.5	Grading and surfacing	125,000	
Mono	23	Mattly Ranch to Leevining	2.2	Surfacing	10,000	
Mono	23	4 miles to 1.3 miles south of Coleville	2.7	Grading and surfacing	34,000	
Mono	23	Conway Summit to 1 mile north of Bodie Road (Federal Lands project: F.L. funds $144,015; State, $38,600)	4.0	Grading and surfacing	38,600	
Kern	23	Mojave to 10 miles north	10.0	Surfacing	15,000	
San Diego	2	Del Mar to Encinitas	6.3	Grading and paving	245,000	
San Diego	2	Las Flores Underpass to San Mateo Creek	10.5	Grading, paving, structures	480,000	
San Diego	2	Santa Margarita River bridge and approaches	1.0	Grading, paving, bridge	300,000	
Riverside	26	South boundary to Avenue 62	9.0	Storm protection, drainage	78,000	
Imperial	26	3 miles west of Westmorland to Trifolium Canal	4.0	Resurfacing	48,000	
Riverside	26	Indio grade separation approaches	1.0	Grading and paving	50,000	
San Bernardino	58	Java grade separation approaches	2.8	Grading and surfacing	60,000	
San Bernardino	31	Verdemont grade separation approaches		Grading and surfacing	20,000	
San Bernardino	31	Mountain Pass to Nevada State line	15.3	Grading and surfacing	415,000	
Los Angeles	60	Walnut Canyon line changes	0.6	Grading and paving	62,000	
		Landscaping (Federal Aid Routes)			44,880	
Subtotal						$5,241,980

CITY PROJECTS

County	Route	Location	Approximate mileage	Nature of improvement	Available		
					From ¼ cent allotment	From regular budget	Total
Los Angeles	9	Los Angeles: Foothill Blvd., Scoville Ave., to Osborne Ave., Tujunga Wash	3.0	Grading, paving, bridge		$235,000	
Los Angeles	60	Long Beach: State Street, Lime Street to Stanley Avenue	1.2	Grading and paving	$60,000		
Los Angeles	60	Los Angeles: N and O Streets from Wilmington Blvd. to Alameda Street	1.5	Grading and paving right of way	100,000	150,000	
Los Angeles	4	Los Angeles: Marengo and Daly Street, Cornwall Street to Main Street		Right of way	63,000	120,000	
San Diego	12	San Diego: El Cajon Avenue		Paving	106,000	94,000	
Total and subtotal					$329,000		$599,000

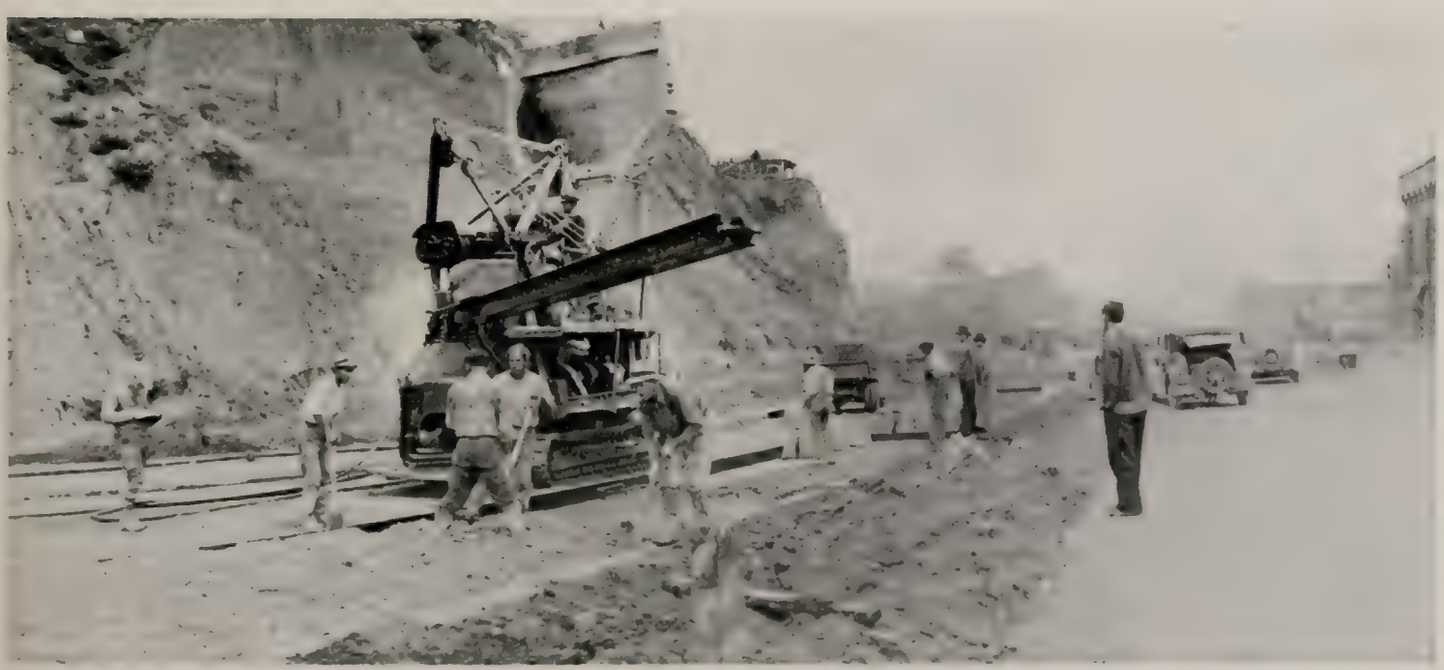
DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS

SECONDARY NORTH

County	Route	Location	Approximate mileage	Nature of improvement	Estimated cost	
					Detail	Total
Lake	15	Upper Lake to Rasmussen Ranch (Middle Creek Bridge)	1.2	Grading, surfacing, bridge	$71,000	
Trinity	20	Trinity River Road (portions)		Grading (prison labor)	165,000	
Trinity	20	Oregon Mountain	1.8	Grading	75,000	
El Dorado	11	Kyburz to Strawberry	9.0	Drainage and surfacing	143,455	
El Dorado	11	Lower Crossing Upper Truckee River and approaches		Bridges and approaches	40,000	
El Dorado	11	Oglesby Canyon	1.0	Surfacing	15,000	
Contra Costa	75	Oakland Tunnel to Walnut Creek (portions)		Grading and surfacing	325,000	
Monterey	10	Lewis Creek to Priest Valley	1.2	Grading and surfacing	30,000	
Monterey	56	Partington Canyon to Big Sur (portions)	8.8	Grading (prison labor)	821,000	
Fresno	41	Kings River Canyon (portions)		Grading (prison labor)	250,000	
Madera	125	Kelshaw to Coarsegold	8.0	Grading and surfacing	230,000	
		Landscaping (Federal Aid Routes)			35,695	
Subtotal						$2,201,150

CITY PROJECTS

County	Route	Location	Approximate mileage	Nature of improvement	Available		
					From ¼ cent allotment	From regular budget	Total
Alameda-Contra Costa	69	Berkeley, Albany, El Cerrito, Richmond: Ashby Avenue to San Pablo Avenue	5.4	Grading and paving	$146,500	$300,000	
Solano	74	Benicia: Route 74 in city		Grading and surfacing		10,000	
Total and subtotal					$146,500		$310,000
Grand total, secondary North							$2,511,150



CONCRETE PAVER AT WORK on the widened Coast Highway along the Palisades in the Santa Monica beach recreational area in Los Angeles County. This contract provides a 76-foot pavement at a point of heavy traffic where the highway swings from the beach toward the portal of the Colorado Street tunnel now under construction.

DETAIL OF MAJOR PROJECT ALLOCATION FOR CONSTRUCTION OF HIGHWAYS—SECONDARY SOUTH

County	Route	Location	Approximate mileage	Nature of improvement	Estimated cost	
					Detail	Total
Kern	58	Seivert to Bear Mountain Ranch	14.0	Surfacing	$20,000	
Kern	58	Tehachapi to Mojave (portions)		Grading and surfacing	100,000	
Kern	142	Kern River bridge and approaches (Isabella	1.0	Bridge, grading and surfacing	75,000	
Kern	141	Three bridges on Oak Street route		Bridges	20,000	
Kern	140	One bridge, two dips east of Taft		Structures	20,000	
Los Angeles	26	Rio Honda Bridge		Bridge	160,000	
Ventura	138	San Antonio Creek and approaches		Bridge, grading and surfacing	35,000	
Orange	176	Carolina Avenue to Santa Ana River (portions		Grading and surfacing	110,000	
Los Angeles	166	San Gabriel River Bridge		Bridge	70,000	
Los Angeles	61	Red Box to Mt. Islip (portions)		Grading (prison labor)	300,000	
Los Angeles	158	Sepulveda Blvd., Culver City to Centinella	1.2	Grading and paving	85,000	
Orange	43	Gypsum Creek to east boundary	2.6	Grading, paving, bridges	175,000	
Ventura	153	Camarillo to Oxnard (portions)		Grading and paving	100,000	
Ventura	79	Sespe Ranch to Fillmore and at Piru		Grading and paving	180,000	
Orange	175	Southeast of Placentia	1.0	Grading and paving	36,000	
Orange	179	Santa Ana River and approaches		Bridges	48,000	
Los Angeles	167	Los Angeles River Bridge and approaches, Atlantic Blvd.		Bridge, grading, paving	271,000	
Orange	183	Santa Ana River, Bolsa Avenue		Bridge	50,000	
Los Angeles	168	Rosemead Ave., Whittier Blvd. to Foothill Blvd., (portions) Rio Honda Bridge	10.0	Grading, paving, bridge	350,000	
Los Angeles	168	State Street to Los Angeles (widening)	3.7	Grading and paving	42,000	
Los Angeles–Orange	174	Norwalk to Anaheim	9.3	Grading and paving	75,000	
Orange	43	West boundary to Prado	3.0	Grading and paving	205,000	
Riverside	19	Beaumont to Bad Lands, S.P. grade separation and San Timoteo Creek	2.3	Grading, surfacing, structures	78,000	
Riverside	194	Junction Routes 19 and 194 to new connection and two bridges	2.5	Grading, surfacing, bridges	43,000	
San Bernardino	26	Colton to Waterman Ave., Santa Ana River	1.9	Grading, paving, bridges	330,000	
San Bernardino	190	Indian Creek		Bridge	10,000	
Riverside	77	Santa Ana River and Chino Creek Bridge and approaches		Bridge	40,000	
Riverside	78	Temecula Creek, Mile Post 72.3		Bridge	14,000	
Inyo	127	Six miles west of Darwin to Panamint Sink	18.0	Grading and surfacing	25,000	
Kern	145	Searles to Randsburg	6.7	Grading and surfacing	9,500	
Inyo	127	Eichbaum Toll Road		Purchase	18,900	
Riverside	64	Ehrenberg Bridge		Purchase	45,000	
Imperial	187	Holtville to Brawley (portions)		Surfacing	104,000	
San Diego	77	Lake Hodges to Escondido	3.1	Grading and surfacing	85,000	
Imperial	202	Midway Wells to Calexico (portions)		Grading, surfacing, bridges	100,000	
Imperial	187	Brawley to Calipatria (portions)		Grading, bridges	75,000	
Los Angeles	167	Atlantic Blvd., Southgate to Bell (County cooperation $21,000)		Grading and paving	32,000	
Los Angeles	174	Manchester Blvd. through Downey (County cooperation $55,000)		Grading and paving	62,000	
		Landscaping (Federal Aid Routes)			29,920	
Subtotal						$3,628,320

CITY PROJECTS

County	Route	Location	Nature of improvement	Available		
				From ¼ cent allotment	From regular budget	Total
Orange	174	Anaheim: Manchester Blvd. from Lincoln St. to south city limits	Grading and paving	$7,600	$75,000	
Los Angeles	158	Los Angeles, Culver City: Sepulveda Blvd. (portions)	Grading, paving, structures C.C.	7,150		
			L.A.	47,070	195,780	
Los Angeles	162	Los Angeles: Santa Monica Blvd., Heath to Sepulveda	Grading, paving, structures	350,000		
Los Angeles	165	Los Angeles: Figueroa Street (portions)	Grading, paving, structures	481,930		
Los Angeles	172	Los Angeles: Fourth Street, Indiana to Fresno	Grading and paving	50,000		
Los Angeles	173	Los Angeles: Tenth Street (portions)	Grading and paving	250,000		
Total and subtotal				$1,193,750		$270,780
Grand Total						$3,899,100
Grand Total, primary and secondary						$21,545,370

Concrete Arch Span Over Malpaso Creek

ANOTHER concrete arch bridge has been completed on the San Simeon-Carmel highway along the Monterey coast.

The new bridge which spans Malpaso Creek, five miles south of Carmel, is 210 feet long with a main span of 117 feet and has a 24-foot roadway with sidewalks on either side. At this location excellent foundations were available for the abutments, so that this was an economical location in which to use a concrete arch.

As shown in the accompanying photographs, the background forms a beautiful setting for this arch bridge so that both an economical and architecturally beautiful structure was secured.

OLD BRIDGE DANGEROUS

This bridge replaces an old narrow combination truss span 206 feet long on very poor alignment which was not safe for legal loads. The curves approaching the bridge at each end were of short radius. The bridge was built many years ago by Monterey County when this highway was a winding, twisting, narrow road from Monterey to Big Sur.

In the past few years the highway has been improved to modern standards and this bridge was the last remnant of the old highway in the twenty-five miles immediately south of Carmel. The sharp approach curves at both ends of the bridge therefore formed a dangerous hazard and caused numerous accidents.

The new and the old highway intersect at the south end of the bridge. In order to take care of traffic during construction, the south end of the old truss bridge was shifted approximately 32 feet east. The shifting of this old combination truss without undue delay to traffic required careful planning and careful work, and was accomplished without accident.

The total cost of the work of constructing this new bridge, including the shifting of the old truss for detour and the construction of the necessary approaches, was approximately $24,000.

I. T. Johnson was resident engineer.

Drunk (bumping into lamp post)—Excuse me, sir. (bumping into fire hydrant): Excuse me, little boy. (bumping into second lamp post and falling down): Well, I'll just sit here until the crowd passes.

State health bulletin warns against kissing as a means of communicating colds. But it must mean platonic kisses. The others burn up the germs.—*Philadelphia News.*

Analysis of Laws Affecting State Highways Enacted by 1935 Legislature

By **ROBERT E. REED**, General Right of Way Agent

THE 1935 session of the California legislature had before it many measures affecting the State's highway system, and, as has been true in previous sessions, the legislature definitely indicated that California should and would continue on substantially its present program of an orderly expansion of state highways.

Inasmuch as the bulk of the 1935 legislation becomes effective on September 15, 1935, it is well at this time to analyze the measures which most directly affect the state highway program and the activities of the Department of Public Works in connection therewith.

ROBERT E. REED

CODIFICATION OF LAWS

The California Code Commission prepared two of the measures enacted by the 1935 session that will prove of great benefit to every one interested in highway matters. These measures are known as the Streets and Highway Code (Senate Bill 147, Chapter 29, Statutes of 1935) and the Vehicle Code (Assembly Bill 170, Chapter 27, Statutes of 1935).

The Streets and Highway Code is a restatement of the various previously existing statutes relating to state and county highway matters. The code brings together in one statute all of these provisions and repeals the numerous enactments heretofore in effect. The code itself makes no substantive changes.

The Vehicle Code is a similar codification of the laws relating to motor vehicles and the regulation of traffic on highways.

Inasmuch as these two measures were enacted early in the session, the substantive changes made by the 1935 legislature were, in the main, amendments to the two codes. The codes were carefully checked during the course of their preparation by the Department of Public Works and it is believed they will be of inestimable benefit in providing easy access to all of the law affecting state and county highways.

SAN FRANCISCO-OAKLAND BAY BRIDGE

Legislation enacted by the California legislature in 1929, 1931, and 1933 provided for the financing and construction of the great San Francisco-Oakland Bay Bridge. To make possible the financing and equipping of the bridge with the facilities necessary to provide interurban transportation, the 1935 legislature enacted Assembly Bill 947 (Chapter 228, Statutes of 1935) at the request of the California Toll Bridge Authority and the Department of Public Works.

This bill amends the California Toll Bridge Authority Act and authorizes the Department of Public Works, under the direction of the California Toll Bridge Authority, to acquire or construct transportation facilities in connection with toll bridges acquired or constructed under the act. It authorizes the same methods of financing such interurban facilities as have previously been made available for financing bridges designed solely for vehicular traffic.

The bill makes it possible for the state to obtain a further loan from the Reconstruction Finance Corporation in the sum of $10,000,000, as well as to use savings made in the construction of the portion of the bridge devoted to vehicular traffic, for the construction of interurban facilities. The R. F. C. has granted the loan of $10,000,000, and all impediments in the way of providing adequate interurban service between San Francisco and the East Bay area have been removed.

Highway Funds Applied to City Streets

(Continued from preceding page)

Assembly Bill 1339 (Chapter 847, Statutes of 1935) provides for the policing of the bridge by the California Highway Patrol and contains certain detailed provisions relating to the collection of tolls by the Department of Public Works. Special traffic regulations made necessary by the physical characteristics of the bridge are also included.

HIGHWAY FUNDS

In 1933 the people of California decisively voted against the diversion of highway funds for other governmental purposes.

This sentiment was also present in the 1935 session of the legislature, with the result that the funds to be devoted to highway purposes were not disturbed. There were four measures affecting State highway funds which deserve mention:

FOR CITY STREETS

Senate Bill 561 (Chapter 642, Statutes of 1935) provides that the net revenue from one-quarter cent per gallon tax on motor vehicle fuel shall be expended by the State upon city streets of major importance, other than state highways. Under this bill, an allocation is made to each city based upon its population. Provision is made for the delegation of the expenditure of the moneys to the city in each instance where the Department of Public Works is satisfied the city is equipped efficiently to handle the expenditure. The allocation for city streets is in addition to the present allocation for State highways within cities.

The moneys can be expended only upon projects which have been first submitted to and approved by the Department of Public Works. The measure will make available to cities approximately $6,000,000 a biennium and will remove from the backs of the local taxpayers this much of their present burden, as this is the first time the State has contributed to the construction and maintenance of city streets other than state highways. Heretofore this expense has been borne solely by the taxpayers of the cities.

FEDERAL AID WORK

At the request of the Department of Public Works Assembly Bill 2433 (Chapter 360, Statutes of 1935) was enacted to enable the State to take full advantage of the moneys made available by the Federal government for highway and grade crossing projects. Under this bill the State is authorized to advance the necessary funds to complete the projects for which Federal funds are available and for which the State will be reimbursed.

The State is authorized to comply with all Federal laws, rules, and regulations imposed upon the expenditure of these moneys. These regulations require that a portion of the money must be expended on other than State highways. The Federal rules and regulations, however, require that all of such money be expended through the State highway departments in the various states.

This bill, therefore, provides that the State is authorized to do the necessary work on streets and highways other than State highways. State money can be advanced for such projects, however, only to the extent that full reimbursement will be obtained from the Federal government.

DIVERSION PROHIBITED

Assembly Bill 313 (Chapter 262, Statutes of 1935) guarantees the return to the State highway fund of any moneys taken for the support of the school system under the provisions of section 15 of Article XIII of the Constitution. The constitutional provision, which thus far has never been used, provides that the support of the schools constitutes a first lien on all State revenues. It has been contended that this provision applies to State highway funds. This bill does not disturb this provision but requires the repayment into the State highway fund, as well as all other special funds, any moneys thus taken therefrom.

Assembly Bill 444 (Chapter 624, Statutes of 1935) increases the minimum quarterly apportionment to counties from $5,000 to $7,500.

CONTROL OF HIGHWAYS

No major changes were made in the weight limitations applicable to highways. Assembly Bill 1295 (Chapter 524, Statutes of 1935) increases the permissible weight of 2-axle trucks where the axles are thirteen feet or more apart, from 22,000 to 26,000 pounds. This measure will not be detrimental to the State highways for the reason that 3-axle trucks at the present time are permitted to exceed this limitation.

Senate Bill 626 (Chapter 384, Statutes of 1935) was introduced at the request of the Department of Public Works to authorize the limitation of weights on certain of the secondary highways where such highways are not at present built to withstand the maximum load permitted by law. The bill was considered necessary to protect the county roads taken into the State System in 1933. Many of these roads are of light construction, and the State has yet had neither the necessary time nor funds with which to improve them to an adequate standard. The weights permitted on a highway or portion thereof can not be reduced below 16,000 pounds, and no limitation below that now prescribed by law can be imposed until an engineering investigation has been made and a public hearing held.

PARKING ON STATE HIGHWAYS

Senate Bill 788 (Chapter 714, Statutes of 1935) amends many sections of the Vehicle Code above mentioned. Included in the bill is the addition of Section 588 to the Vehicle Code, providing that except when loading or unloading merchandise all vehicles parked on state highways must be parked parallel to the curb or edge of the roadway. It is believed that this measure will aid materially in reducing heretofore existing "bottle necks" in many of the cities, particularly where the State highway constitutes the main street in the city.

FRANCHISES

Assembly Bill 650 (Chapter 631, Statutes of 1935) was introduced at the request of the representatives

(Continued on page 22)

New Road to San Juan Bautista, Old Mission Town, Opened to Traffic

By **L. H. GIBSON**, District Engineer

UPON the completion in 1932 of the San Juan Grade elimination project north of Salinas, locally known as the Prunedale Cut-off, the picturesque mission town of San Juan Bautista found itself some three miles off the main traveled Coast Highway. The motorist wishing to visit the historic mission in the town was compelled to travel over the old and dangerous San Juan Grade, or over an old winding graveled county road, known as the "Rocks Road" because of its origin at the Pinecate Rocks through which the new Prunedale Cut-off runs.

The motorist from the south or the Monterey Peninsula district, going to the San Joaquin Valley via the Pacheco Pass, was also obliged to travel over this same grade, or the inferior county road, or go on to Gilroy and thence over the Pacheco Pass.

In order to provide a somewhat better connecting road from the Prunedale Cut-off to San Juan Bautista, the 1933 Legislature made the above-mentioned "Rocks Road" a part of the State Highway System, and it was immediately temporarily improved by applying an oil and screenings seal until a more satisfactory connection could be provided.

COMMISSION HEEDED REQUEST

Led by the able and eloquent Father Caffrey of the Mission San Juan Bautista, public spirited citizens asked the Highway Commission to provide a more direct and adequate connecting road. As soon as funds were available the Commission acted favorably upon this request and made the necessary allocation during the past biennium for the construction of such a connection, which is now completed and opened to traffic.

This connection, 2.6 miles in length, known as the "Rocks Road," runs easterly from a point on the Prunedale Cut-off, two miles northeasterly from the Pinecate Rocks, to the town of San Juan Bautista. The road skirts the northerly edge of the Gabilan range of mountains over which the old San Juan Grade wound its way and eliminates any mountain driving for the traveler wishing to visit the Mission San Juan or desiring to proceed easterly to Hollister and thence to San Joaquin Valley points.

FEDERAL FUND PROJECT

The road has a standard 30-foot roadbed, with minimum 1500-foot radius curves except for one curve in the town of San Juan, and is surfaced with a 20-foot 4-inch crusher-run base and a 20-foot 3-inch road-mixed oil surfacing and seal. The grading and surfacing of the road has been completed at a cost of about $62,000 the project being financed from the 1935 Federal appropriation of U. S. Public Works highway funds.

A feature of the work, when completed, will be the landscaping of a broad "Y" intersection with the Coast Highway. The central portion of the "Y," between the traveled ways, has been left a foot or two above the road bed and will be enclosed with an adobe wall and rustic gates typical of the Spanish motif. Within this wall will be placed an appropriate directional marker indicating the San Juan Mission.

CAMPANILE AND CROSS

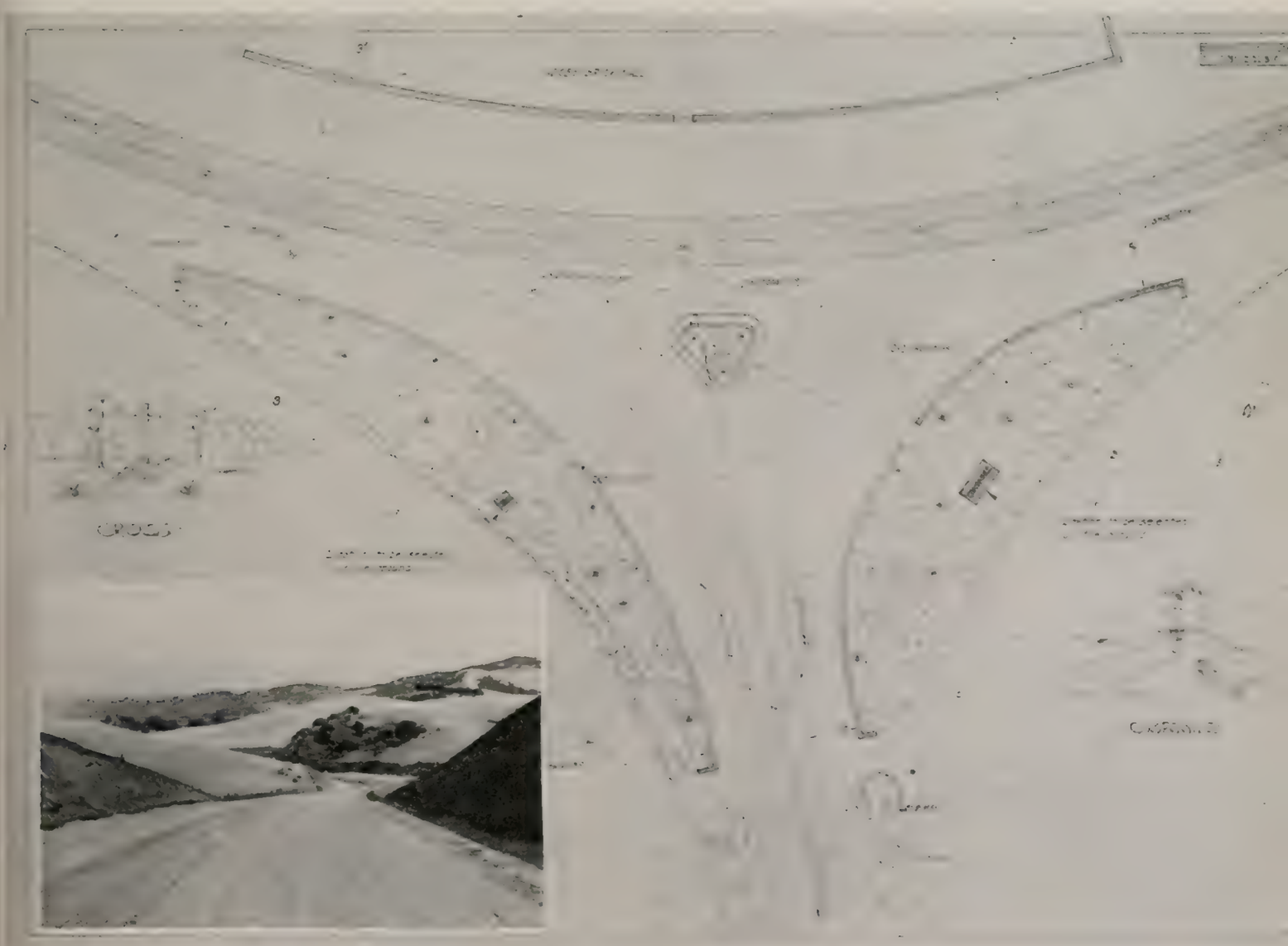
Along the outside edge of the two entrances, adobe walls will also be constructed. Back of these walls a generous right of way has been obtained, and the intervening area somewhat raised above the roadbed and will be planted with appropriate trees and shrubs. Within the park area to the north will stand a Campanile of mission design and in the southerly park area a large rough hewn redwood cross, both features being emblematic of the San Juan Mission to which the road directly leads.

Across the main highway to the west, and opposite the new road, is planned a high adobe brick wall with a rustic entrance gate, and the area behind will be planted with trees and high shrubs.

The landscaping work at the "Y" is yet to be undertaken and will be financed from one per cent of the Federal allocation for road construction in 1935 specified for use in highway beautification projects.

The new road, which by act of the 1935 Legislature, is made a part of the primary highway system, should be a time saver and be much safer for the motorists traveling from valley to the sea. When completed, this landscaped intersection should prove a beckoning influence to the motorist to pause in his travels long enough to visit this old shrine and its quaint village.

CROSS AND CAMPANILE will mark this intersection of the new road to the mission town of San Juan Bautista with the Prunedale cutoff.



BEAUTIFICATION PLAN to include emblematic structures and adobe wall at intersection pictured above. Inset shows portion of new State Route to San Juan Bautista.

Dedication of Redwood Highway Sector

(Continued from page 2)

Crescent City and Del Norte County. General Chairman H. G. Ridgway presided as master of ceremonies.

TWO GOVERNORS REPRESENTED

Edward J. Neron, Deputy Director of the State Department of Public Works, officially represented Governor Frank F. Merriam and Earl Lee Kelly, Director of Public Works.

State Senator John D. Goss of Oregon officially represented Governor Charles H. Martin of that state.

Other speakers included: Alexander Popper, President Crescent City Chamber of Commerce; Supervisor J. J. McNamara, representing the Del Norte County Board of Supervisors; Assemblyman M. J. Burns, representing Humboldt, Del Norte and Mendocino counties; President M. Goldman, Vice President G. E. Frevert and A. E. Dalton of Redwood Empire Association; Oscar Goodcell, Automobile Club of Southern California; Robert Thomas, Maintenance Engineer, representing J. W. Vickrey, District Engineer, Division of Highways, Eureka; State Senator James Chinock of Oregon; Newton B. Drury, representing the State Park Commission, and L. V. Campbell, Engineer of Cooperative Projects, Division of Highways, Sacramento.

CHRISTENING CLIMAXED PROGRAM

Climax of the day's program was the christening of the new highway sector with a bottle containing waters from the Klamath and Smith Rivers and the Pacific Ocean.

The celebration was sponsored by the Del Norte County, Crescent City, Smith River and Klamath Chambers of Commerce and the Redwood Empire Association.

The new highway has been constructed to standards of width, grade and alignment which, estimates of future traffic density indicate, will be adequate for some years.

Seven miles of this nine mile section follows closely along the top of a ridge parallel to the coast from 600 to 1100 feet above the ocean, through a dense virgin redwood forest. Three miles of this area lies within the California State Park System, where the forest will be preserved in its natural state.

OLD ROAD MAINTAINED

The old road also traverses this park area at a lower elevation where it will be maintained and serve as a park road.

The entire roadway has been surfaced with nine to twelve inches of crushed rock and provision made for successive applications of oil as required.

Several large slides have occurred which have brought the total excavation to in excess of 700,000 cubic yards. These slides have been removed for a safe distance from the shoulders. They continue to move, however, and no doubt will be a considerable factor in maintenance cost for a few years.

SLIDE MENACE CEASING

But the soil is such that they will gradually cease to move and will not become the perpetual menace and source of expense encountered along the so-called Crescent City Bluffs or the old highway.

The new road leaves the forest area five miles south of Crescent City at an elevation that affords a panoramic view of the Smith River Valley and the rugged coast line for many miles toward the east and north.

The construction work was done by contract under the supervision of the District I engineers of the Division of Highways.

SODA POP PAYS $3,495,000 GAS TAX ON 50,000 AUTOS

Gasoline and carbonated beverages are closely related, at least so far as taxation is concerned.

This is interestingly demonstrated by the American Petroleum Industries Committee in a recent statement which reads, in part, as follows:

"Recent estimates reveal that the carbonated beverages industry pays something like $3,495,000 annually on the 75,000,000 gallons of gasoline consumed by the 50,000 motor vehicles which transport the beverages from manufacturers to consumers. An additional $73,571 in federal taxes is paid on the 7,357,-150 quarts of lubricating oil consumed by the beverage trucks.

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 SEPTEMBER, 1935 No. 9

Traffic Creates Problem

One of the major traffic blocks on the southern section of the Coast Highway, that through the Laguna Beach business district, is to be relieved to a certain extent, at least, by the new law of the State that parallel parking must be put into effect on all State highways.

Unfortunately for Laguna Beach and coast traffic between Long Beach and San Diego, the Coast Highway also makes a considerable turn in the center of the Laguna Beach business district, which lies between two hills. All of these factors, coupled with the fact that Laguna Beach is one of the busiest communities along the coast these days, complicate the problem. Naturally, Laguna Beach does not want heavy traffic whizzing through its business district to endanger shoppers and others. Yet the slowly moving string of irritated motorists through that street this summer was not pleasing, either to the city or to the drivers. Intersection regulation, on at least one intersection, may be necessary, but will not solve the problem, it is feared. Removal of angle parking will help, not because it will permit high speed, but because it will relieve congestion of through traffic occasioned when parking motorists back out into the center of the coast highway, a constantly recurring irritant on busy days.—*Long Beach Press-Telegram.*

Cub Reporter: "I'd like some advice, sir, on how to run a magazine."

Editor: "You've come to the wrong person. Ask one of my subscribers."

"Sir, I wonder if you'd help a girl in trouble?"

"Sure, what sort of trouble do you want to get into?"—*Rotary Reminder.*

Gas Tax Revenues Show 6.8% Increase for Six Month Period

GASOLINE tax assessments for the month of July, 1935 exceeded those of July 1934 by 42.76%. The figures are as follows:

July 1935	$4,351,472	
July 1934	3,048,038	
Increase	$1,303,434	42.76%

Since the assessments for July, 1934, were abnormally low, and for July, 1935, abnormally high, the above rate of increase does not have a great deal of significance. The trend of gasoline sales is unquestionably upward but not at the rate which might be indicated by the July comparison. Assessments for the first seven months of this year and last should provide a fair basis for comparison. The figures are:

Jan. 1, to July 31, 1935	$24,714,121.51	
Jan. 1, to July 31, 1934	23,114,129.51	
Increase	$1,599,992.00	6.8%

A three month comparison might be made as follows:

May 1, to July 31, 1935	$11,741,265	
May 1, to July 31, 1934	10,026,772	
Increase	$1,714,493	17.01%

TRUCKS AID FLOOD VICTIMS IN DRINKING WATER SHORTAGE

An acute emergency existed during the recent floods in New York state when pure drinking water had to be provided speedily for large numbers of persons who were in almost inaccessible places.

Responding to a plea by Governor Lehman, milk truck operators placed their equipment in emergency service as soon as delivery of milk in the tanks had been effected.

Filled with water, the tank-trucks were sent into the stricken areas, their drivers overcoming many obstacles and difficulties as they made progress over flood-attacked highways and roads. In addition to the loads of fresh water, many of the trucks also carried supplies of food and other necessities.—*Highway Highlights.*

"John," she said, "I've got a lot of things I want to talk to you about—"

"Good," said her husband, "I'm glad to hear it. Usually you want to talk to me about a lot of things you haven't got."—*What Cheer.*

Approximately 3560 miles of modern highways have been built in eight central and southeastern provinces of China since May, 1932.

Russia in 1935 plans to manufacture 92,000 passenger automobiles, 20,000 trucks and 15,000 tractors.

Safety Method of Boring Yerba Buena Tunnel Leaves Core to be Removed

MORE than 350 feet of the 540-foot Yerba Buena Island Tunnel is now completely lined with concrete of a minimum thickness of four feet on its side walls and a minimum thickness of three feet over its crown, according to Chief Engineer C. H. Purcell's last report to State Director of Public Works Earl Lee Kelly.

Bids on Contract 5, Yerba Buena Crossing, including island anchorage, tunnel, piers, concrete viaduct, and the relocation of certain existing roads and buildings, were opened March 28, 1933, and the low bidder was awarded the contract for $1,821,129.50.

The crossing of Yerba Buena Island, a military and naval reservation, occupying a 400 acre outcropping of sandstone, is by means of a reinforced concrete viaduct, four 288-foot steel truss spans, and a 540-foot tunnel.

WORLD'S LARGEST BORE

The main vehicular tunnel, without its concrete lining, will be 76 feet wide by 58 feet high making it the largest bore tunnel in the world. It will accomodate two traffic decks. The upper deck will have six lanes for fast automobile travel; the lower deck will have three lanes for heavy trucks plus two tracks for interurban trains.

A tunnel was chosen for this portion of the work rather than an open cut because the very high and steep side slopes of the latter would have created the hazard of dangerous slides. In addition, such a cut would be a restriction to the best use of the island by the government agencies occupying it, and would have created an unsightly scar.

PRECAUTOINS AGAINST CAVE-INS

In constructing the tunnel it was anticipated that the rock for the first 200 feet from the west portal would be somewhat broken and incapable of supporting itself. Cement grout under as much as 300 pounds pressure was pumped into twenty-five 1½ inch holes which were bored horizontally into the rock and over the crown of the tunnel before any digging was started. By this means the rock was sufficiently strengthened to facilitate driving the bore.

When completed the tunnel will be continuously lined. The roof will be supported by 16-inch steel arch ribs spaced every three feet. This steel will be embedded in concrete with a crown thickness of three feet.

Due to the large cross section and short length of the tunnel, no mechanical ventilation is provided.

In the construction of the main vehicular tunnel, the open portals at both the east and the west ends were first excavated.

NOVEL METHOD PURSUED

A novel method of excavating the world's largest bore tunnel was conceived by Chief Engineer Purcell of the San Francisco-Oakland Bay Bridge and his staff, the novelty of which consists chiefly in that they first build the tunnel and then dig it out.

Three bores were drilled through the island for the tunnel. The three bores, two at either lower side and one in the crown, are blocked out into a horseshoe-shaped excavation through the rocky island. This horseshoe-shaped excavation is then concrete and steel lined from three to five feet thick before the inside or core of the tunnel is dug out.

With the tunnel completely lined for most of its length of 540 feet, a power shovel enters the portal to remove the thousands of cubic yards of rock within this 58 by 76-foot bore. Through this bore a four-story building could be pulled upright.

In the photo a huge power shovel may be seen dwarfed by the size of the mouth of this tunnel through which 30,000,000 vehicles and 50,000,000 train passengers can speed annually after the opening of the bridge by Governor Frank F. Merriam in the fall of 1936.

Marshal: "Yes, this is the fire department. Do you want to report a fire?"

New Bride: "Oh, no; I just want to order coal and wood for the winter."

Wife (reading from paper)—"Here's an old hen they've found with two hearts."

Husband—"Yeah? Well, I played bridge with her the other night."—*Border Cities Star.*

He—"Who spilled mustard on this waffle, dear?"

She—"Oh, John! How could you? This is lemon pie."—*Wise Cracks.*

It's perfectly all right for a woman to hang on to her youth, but not while he's at the wheel.

YERBA BUENA ISLAND TUNNEL of San Francisco-Oakland Bay Bridge project as it will appear when completed.

DOWN TO THE CORE. With the tunnel completely concreted and steel lined by novel construction methods a steam shovel begins removal of thousands of cubic yards of rock from 58 by 76-foot bore.

Law Fixes Control of Signals on State Highways in Cities

(Continued from page 15)

of the counties and cities. It was discussed and worked out with the Department of Public Works. It provides that franchises heretofore granted by cities or counties to public utilities for the use of streets or highways which have since been taken into the State highway system shall remain effective, but the State is empowered to enforce all of the provisions of the franchises regarding the care and maintenance of the facilities on the highways. The revenues from these franchises, under the bill, will be retained by the counties or cities concerned.

TRAFFIC SIGNS AND SIGNALS

Assembly Bill 1654 (Chapter 590, Statutes of 1935) provides that the approval of the Department of Public Works must first be obtained before any stop sign or traffic control signaling device can be erected or maintained by local authorities in such a manner as to interfere with traffic on State highways within cities.

CONSTRUCTION AND MAINTENANCE

CONTRACTS

There was but one minor change made in the State Contract Act, that relating to the publication of notices for bids. The former law provided for the publication in two trade journals, one published in San Francisco and the other in Los Angeles. Senate Bill 236 (Chapter 533, Statutes of 1935) provides that the publication shall be as formerly provided or, in the discretion of the Department, in one trade journal and in a local newspaper.

Assembly Bill 545 (Chapter 322, Statutes of 1935) permits common carriers to grant free or reduced rates to contractors upon public work.

Senate Bill 233 (Chapter 837, Statutes of 1935) repeals the so-called alternate bid law which was enacted in 1933.

No action was taken by the 1935 legislature to extend the effective period of the thirty hour week, the California Industrial Recovery Act, or the supplement to the California Industrial Recovery Act. None of these statutes, therefore, is now in effect.

CONVICT LABOR

Technical changes in the procedure to be followed in the employment of convict labor were made by Assembly Bill 713 (Chapter 733, Statutes of 1935). Little change in the existing procedure is necessitated by the new law.

MISCELLANEOUS

Senate Bills 234 and 235 (Chapters 305 and 306, Statutes of 1935) authorize the State to purchase water from mutual water companies without subscribing to stock in the companies. Under the State Constitution the State is prohibited from owning stock in any private corporation and heretofore considerable difficulty has been encountered in obtaining water from these mutual water companies, as they have heretofore sold water only to their stockholders.

Assembly Bill 630 (Chapter 514, Statutes of 1935) makes many minor changes in the Streets and Highways Code.

M Street Bridge Will Be Opened to Traffic in November

(Continued from page 4)

All mechanisms are electrically operated from the machinery house with the exception of a few signals which will be operated by the watchman stationed at the east end of the bridge. All machinery has been placed but not put into operation. However, it is expected that in the very near future the lift span will be lowered to its resting position and the concrete deck placed.

PLANTING WEST APPROACH

In line with the present state policy of beautifying state projects, some 2,000 feet of the west approach will be planted with trees and shrubbery.

It is expected that railroad traffic will be turned onto the new bridge, the latter part of October and highway traffic the latter part of November. Work must be carried out in this order as part of the detour now being used by the railroad must be torn out before part of the rear abutment can be finished.

CHANGES IN AND ADDITIONS TO THE STATE HIGHWAY SYSTEM

The changes in the State highway system were relatively few at this session. In several instances substitutions in the secondary system were made. In other instances the existing descriptions were clarified. Space does not permit the explanation in detail of each of these changes, but reference is made to the following chapters of the 1935 statutes: 274, 426, 427, 429, 513, 626, 630.

Assembly Bill 2080 (Chapter 634, Statutes of 1935) authorizes the acquisition of the Muir Woods toll road.

OTHER ENACTMENTS

There are many other enactments of the 1935 session which affect highway administration, and the foregoing are listed merely because they seem to be of major importance. Reference should also be made to the following 1935 statutes:

Assembly Bill 61, Chapter 460—Technical changes in Outdoor Advertising Act relative to exempted signs.

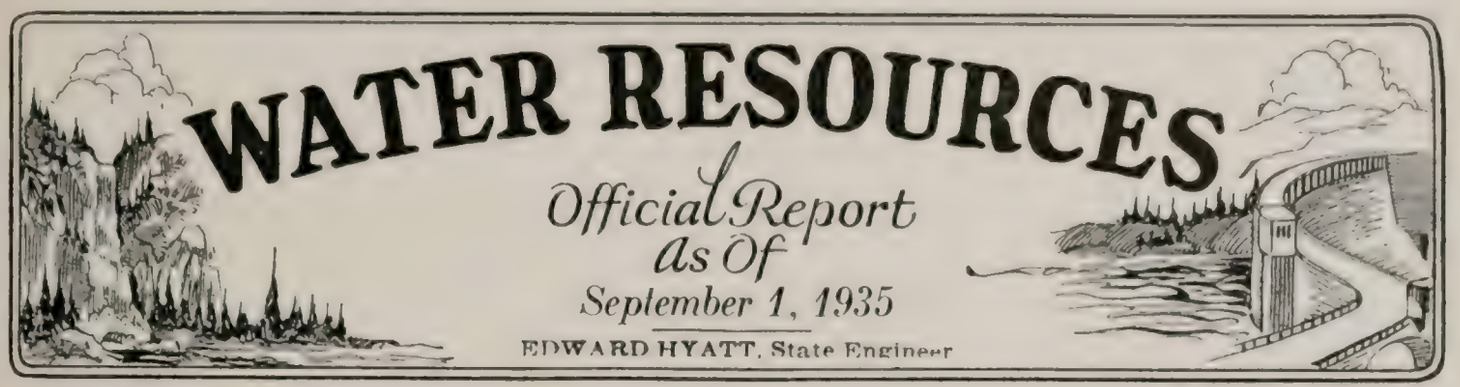
Assembly Bill 800, Chapter 390—Imposing an additional limitation of loads on light trucks.

Assembly Bill 838; Chapter 689—Authorizing a new procedure to be followed in changing the grade of a State highway within a city.

Senate Bill 101, Chapter 164 (See also Senate Bill 561, Chapter 642, which contains a similar provision)—permitting apportionments to cities incorporated since the last census.

Senate Bill 822, Chapter 263—Changing the definition of maintenance.

In conclusion it must be stated that highway matters and those interested therein were given every consideration by the 1935 session of the legislature.



A loan of $8,600,000 has been granted by the Reconstruction Finance Corporation to Merced Irrigation District to be used in refunding a bonded indebtedness of $16,191,000. This is the largest single loan granted by the corporation to irrigation districts in this state.

Revised plans for San Gabriel Dam No. 1 in Los Angeles County have been approved and construction is proceeding on five dams in the Santa Clara Valley Water Conservation District.

Other news of the irrigation districts, flood control and reclamation projects, dam applications, water distribution and stream flows is given in the regular monthly report of the State Engineer as follows:

IRRIGATION DISTRICTS

At request of the directors of Hollister Irrigation District, San Benito County, a meeting was held with the board to consider problems confronting the district. Among these is the realignment of boundaries of the district and revision of plans for a water supply.

The contract has been let and work is in progress on the construction of a storage dam West Branch, South Fork of Pit River. Storage back of this dam will provide water for the South Fork Irrigation District, Modoc County.

An election on the organization of the North Kern Water Storage District has been called by the State Engineer for October 8th.

Districts Securities Commission

Action on the petitions of various irrigation districts to the California Districts Securities Commission is shown in the following orders issued by the commission to the districts:

East Contra Costa: Approval of refunding bonds for certification by the State Controller; exchange of refunding bonds.

Newport Heights: Approval of refunding bonds for certification by the State Controller.

Paradise: Approval of amended plan of debt readjustment.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

Maintenance work has proceeded with a small crew. The small irrigation plants for the willow planting have been put in service, and the ditches have been cleaned by relief labor from Federal Transient Camp Weir No. 8.

Relief Labor Work

New applications have been submitted to the Works Progress Administration covering clearing in the by-pass and overflow areas. It will probably be some time before these applications are passed upon, but it is expected that relief labor in quantity will not be available before October 15th in the Sutter and Yuba County area.

Sacramento Flood Control Project

Work has commenced on the construction of a bridge for the Reclamation Board on the Charles Seavers property north of Colusa. Piles are being driven by our own maintenance driver. In addition to the bridge, four large culverts are to be installed in this vicinity, and the supports of the Cheny Slough Irrigation Company flume, where it crosses the borrow pit, are being reconstructed. The entire estimated cost of this job is $3,700.

Considerable work has been done in conjunction with the Reclamation Board in connectiton with the new program for bank protection, levee and construction as inaugurated by General Jackson, division engineer of the U. S. Engineers.

Construction work has commenced on the three drainage pumping plants in the Sutter By-pass by Frederick W. Snook Company of San Francisco. This work is being done under the direction of the California Debris Commission at a cost of $230,000.

DAMS

Revised plans for San Gabriel No. 1 dam were approved by the State Engineer on August 12th after intensive study and review by the department, assisted by the State's Board of Consulting Engineers.

Application was filed on July 22, 1935, for construction of a 32-foot concrete arch structure on Clear Creek in Siskiyou County. The proposed dam is estimated to cost $9,500 and is to be used for power purposes. This application was approved on August 15, 1935.

Certificates of approval have been prepared for issuance on twelve dams located principally in the

(Continued on page 24)

$20,000,000 Approved for Water Plan

(Continued from preceding page)

high mountain areas of Plumas, Alpine and Tuolumne counties.

Construction work on Grant Lake dam by the City of Los Angeles, Bureau of Light and Power, is progressing.

Construction of the Santa Clara Valley Water Conservation District dams is progressing rapidly. Vasona dam has been completed. Work at Coyote, Calero and Guadalupe consists principally of placing fill and that at Stevens Creek and Almaden in excavation of cut-offs, outlet conduits and stripping of foundations.

At O'Shaughnessy dam construction camps have been established and excavation of foundation for the enlarged section has been commenced.

Repair work revealed as necessary by recent maintenance inspections, because of the unusually severe winter is actively under way on many dams.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Field work comprising the measurements and records of all diversions, stream flow and return flow throughout the Sacramento-San Joaquin territory and salinity records in the Delta have been continued during the past month under a reduced program.

The Sacramento River at Sacramento reached its minimum flow for the season at about 3000 second-feet early in August. Since then there has been a slight increase in flow due to increased return flow from irrigation. On August 1st, the flow of the San Joaquin River near Vernalis was 1100 second-feet as compared to 350 second-feet on the same date in 1934.

The salinity at Upper Bay and Delta stations as indicated by water samples taken on August 10, 1935, is shown in the following tabulation. This shows also a comparison with the corresponding salinity on August 10, 1934.

Station	Salinity in parts of chlorine per 100,000 8/10/35	8/10/34
Point Orient	1600	1720
Point Davis	1300	1660
Bulls Head	940	1380
Collinsville	180	860
Emmaton	15	500
Rio Vista	3	260
Antioch	115	740
Curtis Landing	44	620
Jersey	30	450
Rindge Pump	16	34
Middle River P. O.	7	40

WATER RIGHTS

Supervision of Appropriation of Water

Twenty-eight applications to appropriate water were received during the month of July, fifteen were denied and twenty-three approved. In the same period seven permits were revoked and the rights under six were confirmed by the issuance of license.

Particular significance attaches to two applications received for mining, domestic, and irrigation uses on San Juan Ridge in Nevada County. These applications involve appropriations from South Fork of Middle Yuba, North Fork of Poorman's Creek, Bloody Run Creek and Shady Creek. The various settlements on the Ridge have found themselves without water in recent years and the San Juan Mutual Water Users Association, which has recently been organized, seeks to develop a water supply for irrigation and domestic uses in this area, which some fifty years ago, before hydraulic mining was discontinued, was a well populated section.

Projects were inspected during July in Alpine, El Dorado and Placer counties with a view to establishing the amount of water beneficially used under permits heretofore issued.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Copies of Tustin and Olinda Quadrangles in Orange County are now available in final form. These sheets were mapped by the U. S. Geological Survey in cooperation with the Division of Water Resources and are published on the scale of 1:31,680.

Final sheets of Santa Felicia Canyon Quadrangle are also now available. This area was surveyed by the U. S. Geological Survey in cooperation with the county of Los Angeles and covers an area northwest of Newhall in northwestern Los Angeles County.

WATER RESOURCES

South Coastal Basin

Work on the South Coastal Basin investigation has continued along routine lines. Study is now being made of the shortage and surplus of water in the various basins.

Central Valley Project

Approval by the President of an allotment of $20,000,000 to the Bureau of Reclamation, Interior Department, for construction of the first units of the Central Valley project in California was announced September 12 by the Division of Applications and Information.

The project will be broken down into units in order to provide an orderly construction program fitting Works Progress regulations, which require completion with allotments of useful units of projects.

Structures necessary for completion of the project within the time limit set will be selected by Dr. Elwood Mead, Reclamation Commissioner, after investigations in the field.

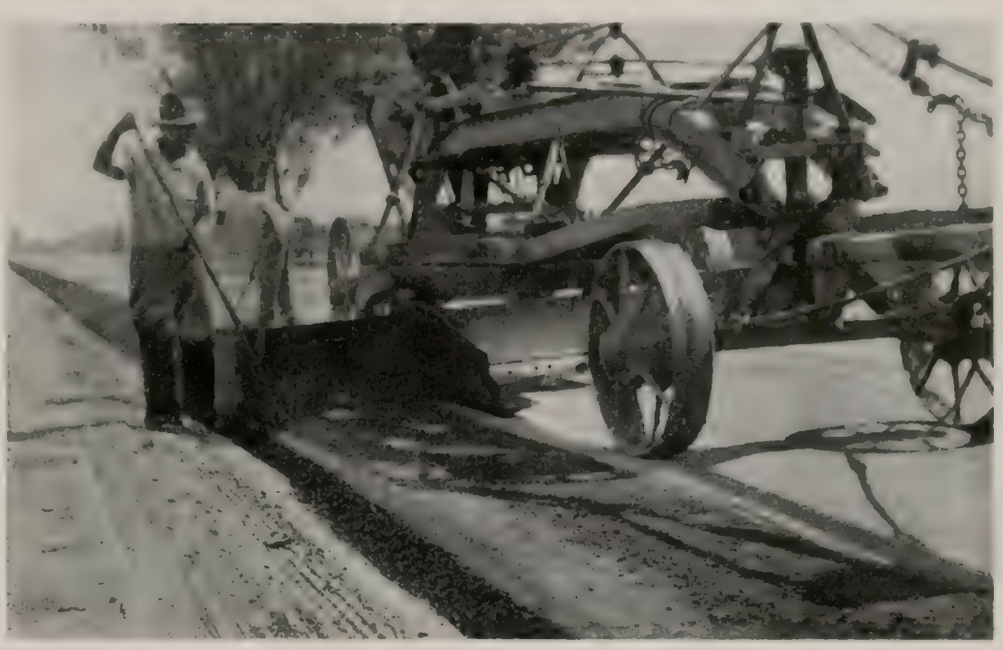
Dr. Mead said a dam at Friant on the San Joaquin River probably would be the principal work undertaken. The cost of this dam is estimated at $14,000,000. From Friant Reservoir lands will be served by two canals, the Madera Canal and the Friant-Kern Canal. Like the dam, these canals make up useful and complete units of the project, as does the Contra Costa Conduit.

Spreader Box Attachments Developed for Oil Rock Borders on State Contract

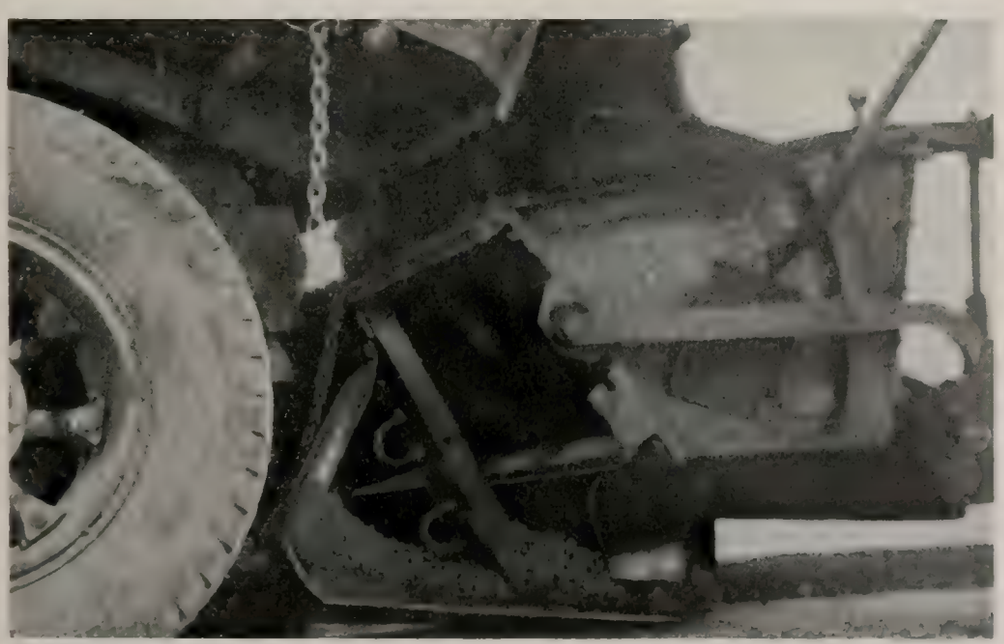
By **C. S. POPE**, Construction Engineer

IN CONFORMITY with requests from the Division of Highways to district engineers that they render a valuable service to all districts by making known special methods of construction which they develop from time to time, the following article furnished by Construction Engineer R. S. Badger of District VI outlines methods worked out in that district for constructing oiled rock borders and reported to the Construction Department.

A contract on a portion of State Highway 4 in Fresno County which was accepted in June, 1935, provided for the construction of one mile of 20-foot asphalt concrete pavement, with 3-foot by 5-inch oil mixed crushed rock borders. The contractor used special attachments to the standard spreader box and grader blade for placing the rock borders, which may be of interest to others engaged on similar work.



Grader and Blade Attachments



Spreader Box with Special Attachments

DETAIL OF ATTACHMENTS

The standard 8-foot spreader box was equipped with two steel shoes bolted to the bottom of the box, one of which rode on the pavement and the other on the earth shoulders. These shoes had a flange which followed along the edge of the pavement as a guide to keep the spreader box in line; the front ends were curved back to prevent digging into the asphalt pavement.

The flange on the outer shoe on the earth shoulders forced loose earth material which fell into the trench back into the shoulder, and also kept the crushed rock from spreading beyond the 3-foot required width of trench.

Since the 6-inch rock borders were placed in two courses the outer shoe was made in two parts, the lower part of the flange being bolted to the upper part when the base course was being placed and removed when the surface course was placed so as not to dig into the base course.

OPERATION OF SPREADER

The 2.5-foot spreader blade which was attached to the regular adjustable blade of the spreader box successfully spread the mate-

(Continued on page 30)

August Storms Damage State Highways

(Continued from page 7)

BY G. H. NUTTING
Maintenance Superintendent

TEN MILES northeast of Weed, in Siskiyou County, on the Weed-Klamath Falls Highway, U. S. 97, is Whitney Creek, also known as Midnight or Inconstant Creek. These various names have been given this stream due to its intermittent and uncertain flow. This creek is fed from a glacier on the north slope of Mt. Shasta and only flows when the weather is warm enough to cause the melting of the glacial ice.

During this period the flow generally reaches the highway about five o'clock p.m. and stops about two o'clock a.m., depending on the temperature of the glacier.

On August 28, 1935, a warm thunder storm on the glacier started the snow and ice to melt and the resulting flow soon assumed the proportions of an avalanche.

BRIDGE DAMAGED

About one thousand feet of the Southern Pacific Railroad track, which crosses the stream about one and one-half miles above the highway, were washed out, and the torrent of water carrying mud, rocks and trees poured down on the highway, cutting under the abutments at the south end of the Whitney Creek bridge and would undoubtedly have washed out the entire bridge except that the channel became blocked about one-half mile upstream and a new channel was cut that missed the bridge by four hundred feet.

A portion of the water poured over the road covering it with rocks and mud to a depth of about four feet. The balance of the stream flowed down the gutter line on the south side of the highway, cutting the ditch to three times its normal depth and washing out the side of the road. This stream followed the highway for eight-tenths of a mile before crossing it and at this point piled up a mass of debris three feet deep and 400 feet long.

Equipment was rushed to the scene the same night and in spite of the continued flow the bridge was repaired, the stream returned to its normal channel and the road again opened to traffic on August 30th.

BY E. Q. SULLIVAN
District Engineer, District VIII

THE LOCATIONS of the heaviest cloudbursts in this district may be outlined as follows:

Between Helendale and Barstow in San Bernardino County rains fell to the southeast of the highway bringing large quantities of sand and gravel with the flow of water, and depositing this debris in the highway dips. The highway was blocked for a period of two or three hours.

On the Death Valley Road, State Highway No. 127, about thirty miles north of Baker, a storm of great intensity in the desert mountains brought large quantities of boulders and mud down onto the highway over a distance of about one and one-quarter miles. The mud was so saturated with water that it was impossible to work any maintenance equipment over the area for about three days. After the water had drained out of the material, tractors and graders were employed to open up this section to traffic. The road was closed for a total period of four days.

DESERT ROUTE FLOODED.

Route 31 near Valley Wells and Route 58 fifteen miles east of Amboy were hit by a storm of similar intensity. The water flowing down upon the highway taxed the structures to capacity and overflowed the highway in many places. No damage on these sections was done except that a few of the stop dykes built for the concentration of water to the structures were washed out.

Between Redlands and Beaumont on Route 26, many of the structures were over-taxed by heavy storm centered in the Yucaipa district. The water in a number of places flowed over the highway and down the parallel drainage ditches, doing considerable damage to the roadsides and shoulders. On this area it was necessary to employ a power shovel and six dump trucks in back-filling shoulders and material scoured from the roadside ditches. Traffic was tied up for an hour or two at one of the locations where the water and sand crossed the highway.

Route 187 (earth road) leading from Route 26 into the Morongo Valley, was scoured badly for a distance of twelve miles.

(Continued on page 27)

DEBRIS FROM SHASTA GLACIER flood waters covered State Highway 72 in storm of August 28 to a depth of four feet as shown in pictures on this page and page 29.

HIGHWAYS DAMAGED BY STORMS

(Continued from preceding page)

In the vicinity of Palm Springs, the secondary highway to Indio by the way of Palm Springs was inundated two or three times by storms occurring in Palm Canyon.

Because of vast burnt off areas in Palm Canyon storms in this area always bring down great quantities of ashes and mud which are deposited on the highway for a depth of two or three feet over a distance of about three hundred feet. Each time a deposit of this kind is made on the highway, the highway is blocked for a period of three or four hours until equipment can clear the travel way.

Traffic Count Shows 15.3% Gain Throughout State over July 1934

By T. H. DENNIS, Maintenance Engineer

THE semiannual count of traffic on the State highways was taken on Sunday and Monday, July 14 and 15, 1935, and covered the sixteen-hour period from 6 a.m. to 10 p.m. each day.

The field sheets segregate traffic by hourly periods under the following vehicle classifications: California automobiles, foreign automobiles, light trucks, heavy trucks, trailers, buses, and horse drawn. In the complete tabulations of the count are recorded the totals of all these types of vehicles on each day of the census.

The total vehicles observed on both days of the count are 15.3 per cent in excess of the number recorded in 1934. A considerable portion of this gain must be attributed to the exceptional traffic attracted to the San Diego Exposition.

68.05 PER CENT GAIN

For instance, a seven-day count on route 2 at the Del Mar overhead railroad crossing north of San Diego shows an increase of 68.05 per cent in total vehicles over last year.

Last year a comparatively slight gain in travel was recorded for the state as a whole. This year the gain is quite general, as will be noted in the following summary:

Per Cent Gain or Loss for 1935 Count as Compared With 1934

	Sunday	Monday
All Routes	+16.2	+14.0
Main North and South Routes	+14.9	+12.8
Interstate Connections	+10.0	+12.8
Laterals Between Inland and Coast	+13.6	+ 9.5
Recreational Routes	+27.3	+27.1

The gain or loss of traffic volume for State Highway Routes 1 to 80, inclusive, which constitute the basis of the above summary, is shown in the following tabulation:

Route	Termini	1935 Per cent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito-Oregon Line	21.99		12.07	
2.	Mexico Line-San Francisco	15.38		15.65	
3.	Sacramento-Oregon Line	15.26		8.11	
4.	Los Angeles-Sacramento	12.26		9.92	
5.	Santa Cruz-Jc. Rt. 65 near Mokelumne Hill	21.62		12.75	
6.	Napa-Sacramento via Winters	24.21		16.15	
7.	Benicia-Tehama Jc.	15.68		7.02	
8.	Ignacio-Cordelia via Napa	27.29		5.31	
9.	Jc. Rt. 2 near Montalvo-San Bernardino		6.28	1.57	
10.	Rt. 2 at San Lucas-Sequoia National Park	32.46		34.26	
11.	Jc. Rt. 75 near Antioch-Nev. Line via Placerville	11.93		14.07	
12.	San Diego-El Centro	14.94		20.81	
13.	Jc. Rt. 4 at Salida-Jc. Rt. 23 at Sonora Jc.	33.59		26.32	
14.	Albany-Martinez	22.13		5.92	
15.	Rt. 1 near Calpella-Rt. 37 near Cisco	33.20		13.61	
16.	Hopland-Lakeport	11.03		11.23	
17.	Jc. Rt. 3 at Roseville-Jc. Rt. 15, Nevada City	20.46		13.56	
18.	Jc. Rt. 4 at Merced-Jc. Rt. 40 near Sequoia	14.13		13.23	
19.	Jc. Rt. 2 at Fullerton-Jc. Rt. 26 at Beaumont	9.17		7.64	
20.	Jc. Rt. 1 near Arcata-Jc. Rt. 83 at Park Bdy.	16.34			1.13
21.	Jc. Rt. 3 near Richvale-Jc. Rt. 29 near Chilcoot via Quincy	2.32		16.04	
22.	Jc. Rt. 56, Castroville-Jc. Rt. 29 via Hollister	30.04		26.40	
23.	Saugus-Rt. 11, Alpine Jc.	6.73		9.78	
24.	Jc. Rt. 4 near Lodi-Nev. State Line	22.07			2.61
25.	Jc. Rt. 37 at Colfax-Jc. Rt. 83 near Sattley	11.40			0.22
26.	Los Angeles-Mexico via San Bernardino	9.72		14.25	
27.	El Centro-Yuma	8.52		12.91	
28.	Redding-Nevada Line via Alturas	2.65			2.11
29.	Peanut-Nevada Line near Purdy's	5.23			2.81
31.	San Bernardino-Nevada State Line		1.24	9.72	
32.	Jc. Rt. 56, Watsonville-Rt. 4 near Califa	24.51		20.33	
33.	Rt. 56 near Cambria-Rt. 4 near Famoso	29.56		40.40	
34.	Jc. Rt. 4 at Galt-Rt. 23 at Pickett's Jc.	39.21		28.18	
35.	Jc. Rt. 1 at Alton-Jc. Rt. 20 at Douglas City		1.34	31.28	
37.	Auburn-Truckee	10.75		9.54	
38.	Jc. Rt. 11 at Mays-Nevada Line via Truckee River	24.65			2.89
39.	Jc. Rt. 38 at Tahoe City-Nevada State Line	33.08		5.76	
40.	Jc. Rt. 13 near Montezuma-Jc. Rt. 76 at Benton	35.93		26.45	
41.	Jc. Rt. 5 near Tracy-Kings River Canyon via Fresno	30.50		22.86	
42.	Redwood Park-Los Gatos	27.49		13.08	
43.	Jc. Rt. 60 at Newport Beach-Jc. Rt. 31 near Victorville	38.04		30.89	
44.	Boulder Creek-Redwood Park	31.10		20.83	
45.	Jc. Rt. 7, Willows-Jc. Rt. 3 near Biggs	19.55		20.21	
46.	Rt. 1 near Klamath-Rt. 3 near Cray	2.54		2.69	
47.	Jc. Rt. 7, Orland-Jc. Rt. 29 near Morgan	32.69		18.52	
48.	Rt. 1 near McDonalds-Rt. 56 near Albion	16.84		10.87	
49.	Napa to Jc. Rt. 15 near Sweet Hollow Summit	30.08			1.61
50.	Sacramento-Jc. Rt. 15	26.67		34.33	
51.	Jc. Rt. 8 at Schellville-Sebastopol	15.18		10.08	
52.	Alto-Tiburon	13.97		21.20	
53.	Jc. Rt. 7 at Fairfield-Jc. Rt. 4 at Lodi via Rio Vista	17.21		9.60	
54.	Jc. Rt. 11 at Perkins-Jc. Rt. 65 at Central House	22.38		7.47	
55.	Jc. Rt. 5 near Glenwood-San Francisco	4.44		8.03	
56.	Jc. Rt. 2 at Las Cruces-Rt. 1 near Fernbridge	14.26		6.12	
57.	Rt. 2 near Santa Maria-Rt. 23 near Freeman via Bakersfield	17.98		17.28	
58.	Rt. 2 near Santa Margarita-Ariz. Line near Topock via Mojave and Barstow	7.22			0.82
59.	Jc. Rt. 4 at Baileys-Jc. Rt. 43 at Lake Arrowhead	12.17		19.31	
60.	Jc. Rt. 2 at Serra-Jc. Rt. 2 at El Rio	33.41		45.66	
61.	Jc. Rt. 4 S. of Glendale-Jc. Rt. 59 near Phelan	5.54		6.50	
63.	Big Pine-Nevada State Line		3.47		5.63
64.	Jc. Rt. 2 at San Juan Capistrano-Blythe	49.11		39.01	
65.	Jc. Rt. 18 near Mariposa-Auburn	13.13		10.22	
66.	Jc. Rt. 5 near Mossdale-Jc. Rt. 13 near Oakdale	29.92		26.56	
67.	Pajaro River-Rt. 2 near San Benito River Bridge	139.12		197.70	
68.	San Jose-San Francisco	13.72		12.07	
69.	Jc. Rt. 5 at Warm Springs-Jc. Rt. 1, San Rafael	38.73		15.58	
70.	Ukiah-Talmage		1.23	10.46	
71.	Crescent City-Oregon Line	20.62		27.54	
72.	Weed-Oregon Line	39.89		40.47	
73.	Rt. 29 near Johnstonville-Oregon Line	25.35		18.09	
74.	Carquinez Bridge-Napa Wye	19.71		10.39	
75.	Oakland-Jc. Rt. 65 at Altaville	9.04		7.50	
76.	Jc. Rt. 125 at Shaw Ave.—Nevada State Line near Benton	6.63		13.38	
77.	San Diego-Pomona	13.64		28.39	
78.	Jc. Rt. 12 near Descanoso-Jc. Rt. 19 near March Field	24.63		16.34	
79.	Jc. Rt. 2, Ventura-Jc. Rt. 4 at Castaic	4.64		14.79	
80.	Jc. Rt. 51, Rincon Creek-Rt. 2 near Zaca	19.54		12.62	

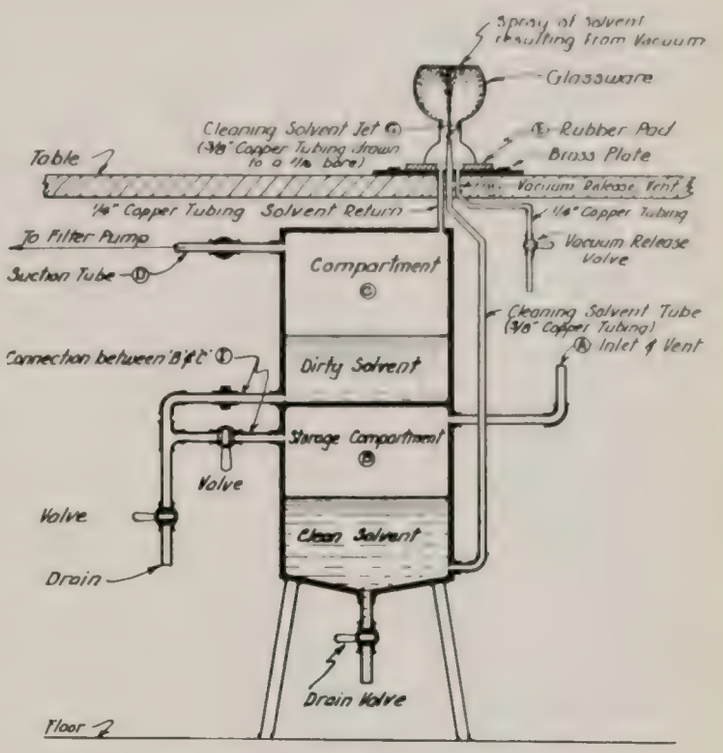
Engineer Develops Method for Washing Oil Stained Glass

A quick and easy method of washing oil or asphalt stained glassware has been developed by Junior Physical Testing Engineer C. E. Rhodes of the Materials and Research Department, Division of Highways.

The apparatus consists of a tank 20″ high by 10″ diameter, divided into equal size compartments. Cleaning solvent is introduced into compartment B through A. Stained glassware is placed open end down on a rubber pad E through which tubes F, G, and H extend. The air in tank C is exhausted by suction through D. This causes a vacuum in the glassware through vent F, forcing the solvent in tank B through tube G with sufficient force to strike the top of the vessel resting on rubber pad E.

The solvent returns to C through F. When the glassware has been washed a valve connected to H is opened breaking the vacuum so that the glassware can be easily removed.

Tanks B and C are connected through I. This cleaning apparatus is so constructed that the solvent accumulated in tank C may



be returned to tank B for further use or can be otherwise disposed of. Tank B is equipped with a valve in the bottom for cleaning purposes.

The apparatus is particularly efficient for cleaning viscosity flasks, distillation flasks, and graduates up to 1000 cc capacity. Vacuum or water filtering pumps may be used to create the vacuum in C.

STATE HIGHWAY 72 BURIED under four feet of mud and boulders by flood waters from Mt. Shasta Glacier and Whitney Creek was cleared and opened to traffic in two days following the storm of August 28. The debris covered the road for a distance of 400 yards.

Oil Rock Borders Placed by Spreader Box Attachments

(Continued from page 25)

rial in the 3-foot trench. The spreader box chains were fastened high on the trucks in order to raise the front ends of the shoes about 1½ inches, thus causing the weight of box to be partially carried by the truck and prevented gouging of the earth shoulders.

One-quarter-inch steel plates were fastened inside the spreader box on each end, forming two false sloping sides or inclined planes, and leaving a 2.5-foot opening in the middle of the box. As the material was dumped into the spreader box, these plates forced it through the opening and spread it the full 3-foot width of border. It was found, however, that a 2-foot opening would have been wide enough to fill the 3-foot trench.

ROLLED BY TRUCK

As specified in the special provisions, the rock borders were laid in two courses. The base course was rolled with a loaded dump truck and it was found that this compacted the mixture more satisfactorily than a roller because the truck tire rolled all portions of the trench, pushing sideways as well as downward, and a much better bond was obtained between the pavement edge and the border.

The grader was equipped with two winged flanges set vertically and perpendicular to the plane of the blade surface. One wing was attached to the end of the blade and the other 3 feet from it. The action of the blade and wings was similar to that obtained by the screens of a mechanical finisher, as the compartment made by the blade and wings was kept full of material at all times and fed or cut as the surface required.

GIVES SATISFACTORY RESULTS

The rock border was left ¼ inch higher than the edge of pavement; hence when the grader blade passed over the border some material fell onto the pavement. A small wooden drag was attached behind the blade on a slight angle with the outside and even with the edge of the pavement, and this drag pushed the scattered material back onto the border. After the material was allowed to cool and set for some time, it was given a final rolling, the above methods resulting in a very good appearing job.

F W. Howard was resident engineer in charge of this contract.

California Second in Gas Consumption in 1934; Third in Revenue

GASOLINE-TAX income continued to increase in 1934 following a rally in 1933, after the year 1932 had shown the first decrease in the history of the tax. According to reports collected from State authorities by the U. S. Bureau of Public Roads, the total of 1934 receipts, with refunds deducted, was $565,027,000—an increase of about 9 per cent compared with 1933.

Receipts for 1933 had shown an increase of about 1 per cent compared with 1932, while receipts for 1932 had shown a decrease of 4.1 per cent compared with the previous year.

Total 1934 consumption was 15,454,481,000 gallons, a new peak.

The five leading states in gallonage taxed were: New York, California, Pennsylvania, Ohio and Illinois.

CALIFORNIA THIRD IN REVENUE

New York collected the largest tax revenue, amounting to $43,927,000; Ohio, $37,618,000; California, $35,960,000; Pennsylvania, $33,409,000; Texas, $31,640,000; Illinois, $29,126,000.

The weighted average State tax rate for 1934 was 3.66 cents per gallon.

Florida and Tennessee had the highest rates, each collecting $.07 per gallon. Arkansas was next with $.06½ followed by Alabama, Idaho, Mississippi, North Dakota and South Carolina with $.06 per gallon.

California with a three cent tax consumed 1,198,650,000 gallons, second only to New York with a consumption of 1,464,242,000.

An increase in consumption was shown by all states and a decrease by the District of Columbia.

AUSTRALIA BAKES SOIL IN ITS EXPERIMENTAL ROAD BUILDING

In Queensland, Australia, there are many areas of heavy black soil. The roads, unless surfaced, are almost impassable in wet weather. The Main Roads Board has built an experimental section of two miles using a machine which bakes the soil into hard clinker-like lumps up to three or four inches in diameter. The soil is baked to depths varying from two to eight inches. The machine covers a strip six feet wide and moves forward at an average speed of 22 feet per hour. On this road a surface 12 feet wide was heated. After baking, the clinker was broken and spread evenly over the road, forming a firm surface.

Highway Bids and Awards for August

CALAVERAS and ALPINE COUNTIES—Between Dorrington and Hermit Valley (X Cal. Alp-24-F,G,A B), about 24.6 miles in length. Liquid asphalt to be furnished and applied. District X, Route 24, Sec. F G, A B. C. F. Fredrickson & Sons, Lower Lake, $8,120. Contract awarded to Hayward Building Material Co., Hayward, $7,659.

EL DORADO COUNTY—About 1 mile length untreated crushed gravel or stone base and road-mix surfacing to be placed at Oglesby Canyon. District III, Route II, Section F. A. Teichert & Son, Inc., Sacramento. Contract awarded to M. J. B. Const. Co., Stockton, $13,915.25.

EL DORADO COUNTY—Between Kyburz and Strawberry, about 7.9 miles. Install C. M. P. culverts, perforated metal pipe underdrains and spillway assemblies. District III, Route 11, Section H. N. M. Ball Sons, Berkeley, $27,864; George Pollock Co., Sacramento, $30,005; Hemstreet & Bell, Marysville, $25,298; Albert H. Siemer, John J. Ongaro, San Anselmo, $27,723; L. C. Seidel, Oakland, $38,350; M. J. B. Construction Co., Stockton, $20,306. Contract awarded to Harms Bros., Sacramento, $18,626.40.

EL DORADO and YOLO COUNTIES—Between Auburn Junction (mi. 7.89) and Cool and between 4 miles N. of Sol-Yolo County line and irrigation canal, 28 miles in length to be treated with liquid asphalt. District III, Routes 93, 99, Sections A, B; A. A. Teichert & Son, Inc., Sacramento, $7,082; Hayward Bldg. Matl. Co., Hayward, $6,474. Contract awarded to Edw. F. Hilliard, Sacramento, $4,325.

INYO COUNTY—Big Pine to east end of Cedar Flat, about 13.5 miles road oil to be applied, District IX, Route 63, Section A-B. Square Oil Co., Inc., Los Angeles, $4,858; Oilfields Trucking Co., Bakersfield, $6,247. Contract awarded to Paulsen & March, Inc., $4,459.85.

INYO COUNTY—Between 0.5 miles west Lone Pine and Darwin, District IX, Route 127, Sections B, C, D, E, F. Gilmore Oil Company, Los Angeles, $5,680; Hayward Bld. Matl. Co., Hayward, $7,524; Square Oil Co., Los Angeles, $5,040. Contract awarded to Paulsen & March, Inc., $4,806.

KERN COUNTY—Between one mile south of Delano and Delano, about 1 mile to be graded and paved with either A. C. or P. C. C. and reinforced concrete underpass abutments to be constructed. District VI, Route 4, Section F, Dln. Hanrahan Wilcox Corporation, San Francisco, $109,752; Peninsula Paving Company, San Francisco, $119,771; Fredrickson & Watson Construction Co.-Frederickson Bros., Oakland, $109,749; Basich Brothers, Torrance, $105,059. Contract awarded to Griffith Company, Los Angeles, $94,994.60.

LAKE COUNTY—Between Middletown and Junction with Lower Lake Road, (20.1 miles) to be treated with liquid asphalt. District I, Route 89, Section B & C. E. A. Forde, San Anselmo, $2,581. Contract awarded to Basalt Rock Co., Inc., Napa, $2,537.50.

LOS ANGELES COUNTY—Sunset Boulevard between La Veta Terrace and Santa Monica Boulevard, about 1.4 miles to be paved with asphalt concrete. District VII, Route 2, Section L. A. Geo. R. Curtis Pav. Co., Los Angeles, $44,343; Southwest Pav. Co., Roscoe, $52,632. Contract awarded to Griffith Company, Los Angeles, $39,913.

LOS ANGELES COUNTY—Firestone Boulevard, between Cerritos Avenue and Mercantile Place and Ramona Boulevard between Aliso and Fickett Streets, to be treated with Liquid Asphalt by road mix method and seal coat applied. District VII, Routes 174, 26. Sections L.A. B. Basich Bros., Torrance, $10,120; A. S. Vinnell Co., Los Angeles, $10,298; Paul R. Hughes, Long Beach, $10,350; Zimmer Construction Co., Los Angeles, $10,455. Contract awarded to Oswald Bros., Los Angeles, $9,940.

MARIN COUNTY—Furnish and apply seal coat between Manzanita and northerly boundary, about 48.9 miles. District IV, Route 56, Sections A, B, C, D. Lee J. Immel, Berkeley, $16,780; E. A. Forde, San Anselmo, $14,800; Hayward Building Mat'l Co., Hayward $14,025. Contract awarded to Pacific Truck Service, Inc., San Jose, $12,559.50.

MENDOCINO COUNTY—Between Gualalla and 8 miles north of Fort Bragg (67.5 miles) to be treated with liquid asphalt. District I, Route 56, Sections A, B, C, D, E, & F. Hayward Building Mat. Co., Hayward, $14,246; Pacific Truck Service, Inc., San Jose, $18,012; Chas. Kuppinger, Lakeport, $12,995. Contract awarded to Albert Helwig, Sebastapol, $12,405.70.

MODOC COUNTY—In Modoc County, between Rush Creek and Adin, about 5.2 miles in length, crushed gravel to be furnished. District II, Route 28, Section A. Tiffany Construction Co., San Jose, $12,000; Beeman & Jones, Stockton, $12,840; Pacific Truck Service, Inc., San Jose, $14,880. Contract awarded to Hemstreet & Bell, Marysville, $10,200.

NEVADA and PLACER COUNTIES—Between ¼ mile west of Soda Springs and Donner Summit, about 3.7 miles perforated metal pipe underdrains and corrugated metal pipe culverts to be installed. District III, Route 37, Sections B, C, G. Hemstreet & Bell, Marysville, $43,062; N. M. Ball Sons, Berkeley, $52,710; George Pollock Co., Sacramento, $38,995; Albert H. Siemer, John J. Ongaro, San Anselmo, $39,144. Contract awarded to Harms Bros., Sacramento, $35,981.10.

RIVERSIDE COUNTY—Between Valle Vista and about 50.1 miles, seal coat to be applied, District VIII, Route 64, Sections L, M, N, P. E. L. Yeager, San Bernardino, $27,840; A. S. Vinnell Co., Los Angeles, $31,125. Contract awarded to Square Oil Co., Los Angeles, $21,644.

RIVERSIDE COUNTY—Between Corona and southerly boundary and between Riverside and Elsinore, about 66.7 miles. Apply seal coat to existing shoulders. District VIII, Routes 77, 78, 19, Sections A, B, C, D, C D, B. R. S. Hazard Constructing Co., San Diego, $18,419; E. L. Yeager, San Bernardino, $18,870; A. S. Yinnel Co., Los Angeles, $19,688; Martin Bros. Trucking Co., Long Beach, $25,171. Contract awarded to C. O. Sparks, Los Angeles, $16,135.

SAN BENITO COUNTY—Between San Benito and Willow Creek and between Route 119 and Pinnacles National Monument, about 13.7 miles to be treated with liquid asphalt. District V, Routes 119, 120, Section C, A. Gilmore Oil Co., Los Angeles, $4,169; Pacific Truck Service, Inc., San Jose, $4,723; Oilfields Trucking Co., Bakersfield, $5,152. Contract awarded to L. A. Brisco, Arroyo Grande, $3,696.

SAN BENITO, MONTEREY, SAN LUIS OBISPO and SANTA BARBARA COUNTIES—Apply traffic stripe to pavement in District V, for a distance of 560 miles. District V, Routes 2, 22, 33, 56, 67, 80, 117, 118, 119, 148 and 149, various sections. S. A. Cummings, San Diego, $4,020; Edwin Anderson, San Francisco, $4,200. Contract awarded to Al. W. Simmonds, Sacramento, $3,604.

SAN BERNARDINO COUNTY—Between Barstow and Mountain Pass ab,out 30.8 miles in length. Seal coat to be applied. District VIII, Route 31, Sections G, H, J, K, M, N. Ernest L. Yaeger, Los Angeles, $15,900; Matich Bros., Elsinore, $15,060; Geo. Herz & Co., San Bernardino, $14,813; R. E. Hazard, San Diego, $16,882; A. S. Vinnell Co., Los Angeles, $16,800. Contract awarad to C. O. Sparks, Los Angeles, $14,025.

SAN BERNARDINO COUNTY—At Mountain Pass Maintenance Station Site. A water supply well to be drilled. District VIII, Route 31, Section N. W. D. Anderson, San Bernardino, $1,975; Lyon Bros., Los Angeles, $1,350; D. A. Beck & Sons, Inc., Alta Loma, $1,095. Contract awarded to Jesse W. Burkhart, Adelanta, $1,007.25.

SAN BERNARDINO COUNTY—Between Alabama Street and State Street, about 1.9 miles to be graded and paved with P. C. C. or A. C. District VIII, Route 26, Section A. Rld. Basich Bros., Torrance, $76,763; Matich Bros., Elsinore, $76,815; B. G. Carroll, San Diego, $77,246; C. O. Sparks, Los Angeles, $79,000. Contract awarded to Geo. Herz Co., San Bernardino, $74,578.40.

(Continued on page 32)

Highway Bids and Awards for Month of August

(Continued from preceding page)

SAN BERNARDINO COUNTY—Between Santa Ana River and M Street in Colton, about one (1.0) mile in length to be graded and a road-mix surface treatment applied, and reinforced concrete abutments for an undergrade railroad crossing, to be constructed. District VIII, Route 43, Sections F & Col. Geo. Herz & Co., San Bernardino, $33,152; Matich Bros., Elsinore, $38,630; Griffith Co., Los Angeles, $41,178; R. R. Bishop, Long Beach, $43,809; Basich Bros., Torrance, $33,069; Louis C. Seidel, Oakland, $35,462; Mundo Eng. Co., Los Angeles, $33,184; Oscar Oberg, Los Angeles, $34,841; Geo. R. Curtis Paving Co., Los Angeles, $42,228. Contract awarded to B. G. Carroll, San Diego, $29,877.

SAN BERNARDINO COUNTY—I Street between west city limits and east city limits of Colton, about 1.3 miles to be graded and paved with A. C. and a reinforced concrete bridge on steel piles to be constructed. District VIII, Route 26, Section Col. Geo. R. Curtis Pav. Co., Los Angeles, $93,726; Basich Bros., Torrance, $94,072; Mundo Engineering Co., Los Angeles, $98,763; Oswald Bros., Los Angeles, $96,650. Contract awarded to Griffith Co., Los Angeles, $90,420.60.

SAN DIEGO COUNTY—Between Jamul and White Star, 46 miles (more or less) treating with liquid asphalt. District XI, Route 200, Sections B, C, D & E. Square Oil Co., Los Angeles, $15,750; Gilmore Oil Co., Los Angeles, $13,792; R. E. Hazard Const. Co., San Diego, $14,287; Morgan Bros., Huntington Park, $13,365. Contract awarded to Paulsen & March, Inc., Los Angeles, $12,318.75.

SAN DIEGO COUNTY—Between Julian and a point 25 miles easterly. Liquid asphalt to be applied. District XI, Route 198, Sections E, F and G. Gilmore Oil Co., Los Angeles, $6,612; Morgan Bros., Huntington Park, $6,850; Paulsen & March, Inc., Los Angeles, $6,649. Contract awarded to Square Oil Co., Los Angeles, $5,978.

SAN MATEO COUNTY—Between Edgemar and Thornton, about 3.6 miles to be graded, surfaced with crusher run base and bituminous surface treatment applied. District IV, Route 56, Section E. Peninsula Paving Company, San Francisco, $107,448; Bayshore Construction Co., Inc., San Francisco, $101,917; Granfield, Farrar & Carlin, San Francisco, $111,479; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $116,793; Healy Tibbitts Construction Co., San Francisco, $121,721; A. Teichert & Son, Inc., Sacramento, $122,337. Contract awarded to Union Paving Co., San Francisco, $97,437.50.

SANTA CLARA COUNTY—Underground crossing under S. P. R. R. about 1¼ miles south of Agnew. Two concrete abutments with W.w's and about .29 mile of roadway to be graded and paved with P. C. C. District IV, Route 68, Section B. Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, $123,240; J. F. Knapp, Oakland, $116,164; Eaton-Smith, San Francisco, $125,480; Peninsula Paving Co., San Francisco, $137,024; Hanrahan-Wilcox Corp., San Francisco, $131,623; Healy-Tibbitts Const. Co., San Francisco, $124,458. Contract awarded to Earl W. Heple, San Jose, $103,850.20.

SANTA CLARA-SANTA CRUZ COUNTIES—Slide removal between Saratoga Gap and Black road, about 1.3 miles. District IV, Route 55, Section A. Bayshore Constr. Co., San Francisco, $5,920; Garcia Constr. Co., Irvington, $8,800; W. E. Karstedt, San Jose, $6,560; Earl W. Heple, San Jose, $5,280; Guerin Bros. San Francisco, $9,440; R. A. Farish, San Francisco, $6,240; Jas. L. Conner, Monterey, $8,320; Harrison & Harrison, Niles, $5,760; Granfield, Farrar & Carlin, San Francisco, $6,720. Contract awarded to Forsythe-Warden Co., San Leandro, $4,480.

SHASTA COUNTY—Between Court Street and California Street, in Redding, about 0.1 miles to be graded and surfaced. District II, Route 20, Section Rdg. T. M. Morgan Paving Co., Los Angeles, $10,687; Tiffany Construction Co., San Jose, $11,683. Contract awarded to Hemstreet & Bell, Marysville, $10,469.

In Memoriam

F. S. CHRISTENSEN, powderman, attached to District II, Division of Highways, came to his death in a premature explosion at Convict Camp 28 where he was employed on the construction of a unit of the Feather River Highway.

Mr. Christensen was born on July 21, 1889, in Denmark and came to America at an early age. During the last fifteen years he has seen service on various construction projects in California in responsible charge of work for several of the larger contracting companies. During the years 1921 and 1922 he was employed by the state as a foreman in a prison camp in District I. He again entered state service in April, 1930, on the Feather River Highway as powderman, where he was employed until his death.

Mr. Christensen leaves a widow and three minor children now living in Oakland, California.

Mr. Christensen was a capable and industrious employee of the state. He was respected for his ability and was highly esteemed by his fellow employees.

RAYMOND FRANKLIN BULAND, assistant highway engineer of District II met his death in an accident while on duty on August 23, 1935, at Tule Lake, where he had gone from his home in Redding as resident engineer on a grading contract between Stronghold and Hatfield.

Mr Buland was born October 14, 1889 at Lynn Grove, Iowa, and was educated at the Iowa State University at Ames, Iowa. He began his career as an Assistant Estimator for the Southwestern Engineering Company at San Antonio, Texas in 1913, and with the exception of a year in the service of his country during the World War, kept to the engineering profession. Prior to entering the service of the State his work was confined to the middle west, from Texas to Wyoming, with two years in Brazil, South America.

He was certified to the position of junior service engineer with the Division of Highways, District II, on May 7, 1930, and in two years advanced to the position of resident engineer.

Besides the widow, Mrs. Martha Elizabeth Buland, he leaves a son, Robert Noel, 9 years of age, and a daughter, Nancy Ann, 2 years of age; a brother, W. L. Buland, and his mother, both of Los Angeles.

Mr. Buland had the friendship and respect of all his associates, and for his friends and his work he had a high ideal of duty and responsibility. His family loses a good husband and father; the State, a conscientious and capable employee and his friends, a friend.

The sympathy of our entire organization is extended to the bereaved family.

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

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Port of Eureka—William Clark, Sr., Surveyor

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MAP
SHOWING
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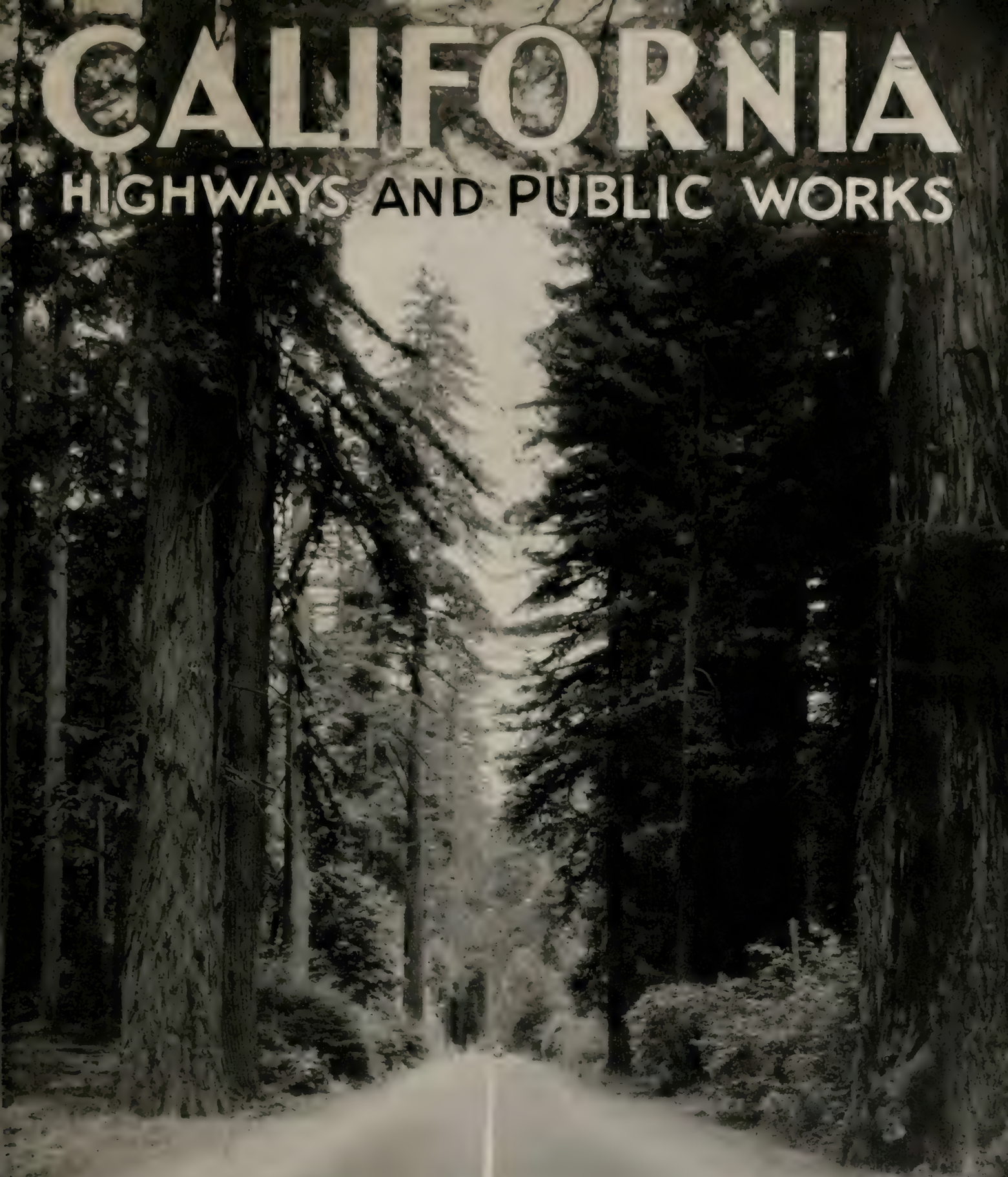

Scene on Redwood Highway
(State Route No. 1) near Prairie Creek

Official Journal of the Department of Public Works

OCTOBER 1935

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39 Grade Crossings

On California Highways

Being Eliminated

With $7,500,000 Federal Funds

By **GEORGE T. McCOY,** Assistant State Highway Engineer

THE Federal Government, in proportioning the money set up by the Emergency Relief Appropriation Act of 1935, has allocated a considerable amount to the purpose of eliminating traffic hazards at railroad grade crossings. California's share of this allocation amounts to approximately $7,500,000, and the Division of Highways has submitted a list of projects to the Bureau of Public Roads on which they recommend this money be spent.

The primary purpose for which this money was provided by Congress is to provide work relief, which means that the work must be gotten under way immediately and should be carried on in locations where it will draw most heavily from the relief rolls, in so far as it is practicable to do this. The Government has made certain regulations governing the way this money must be spent. It is required that the money be apportioned to projects on the various railroads according to their mileage in the State and that no Federal funds be used to pay the costs of right of way and property damage.

GEORGE T. McCOY

It is also required that at least 25 per cent of the money be spent off of the Federal Aid Road System and at least 35 per cent within the metropolitan areas. The latter requirement imposes a serious restriction upon the choice of projects, as the cost of right of way and property damage in metropolitan areas is likely to be excessive, and even if within reason, the local community may have no available funds.

The oft repeated statement that grade separation projects are the easiest to get under way within a short period of time must be taken with a grain of salt. In the first place, they are, as stated, likely to be located in settled areas where traffic is heaviest and where considerable dickering must be done with regard to acquiring property, moving buildings, changing street grades, relocating adjacent streets or roads, moving pipe lines and sewers, and all of the thousand and one problems that must be solved before a contract can be let. This requires separate dealings with property owners, local government officials, officials of the public utilities and of the railroad com-

(Continued on next page)

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Bad Record Crossings to be Abolished

(Continued from preceding page)

panies, all of which require considerable time for exchange of views and proper study of the situation.

Although practical considerations, which in this case include the limitations placed by the Federal Government, are primary factors controlling the choice of grade crossing projects, the Division of Highways has, nevertheless, endeavored to restrict the choice of projects to only those on major highway and railroad traffic arteries, to grade crossings which have unusually bad accident records and to rebuilding existing dangerous grade separation structures.

CROSSINGS TOTAL 12,500

Many people are of the opinion that the elimination of any grade crossing whatsoever represents a material step in making the highways safe for traffic. It will be found interesting to give this assumption a little study:

In the first place, there are some 12,500 crossings in the State of California, and to separate all of them would require an expenditure of at least three-quarters of a billion dollars and probably more. Suppose that this huge sum could be raised in some manner or other, what would be the general result with regard to reducing traffic hazards on highways?

From an examination of 1934 traffic statistics in the United States, it is found that by separating all our grade crossings, and assuming that no accidents take place afterward at the separations themselves, the total number of highway accidents will have been reduced by about ½ of 1 per cent. In the matter of deaths due to traffic accidents they will be reduced about 3 per cent.

ACCIDENT RECORD RATIOS

However, before becoming totally discouraged, let us look further into the records. The California Railroad Commission keeps a record of all crossings in the State, with a list of the accidents which have occurred at each of them starting with the year 1926. In the report on grade crossings of 1931, prepared jointly by the Railroad Commission and the Division of Highways, it is stated that up to 1931, 70 per cent of grade crossing accidents occurred at 10 per cent of the crossings, and that 40 per cent of the accidents occurred at 3 per cent of the crossings.

To put it another way, no accidents occurred during this period at 67 per cent of the crossings. Assuming that these ratios will not change appreciably, and there is no reason to believe that they will, the answer would be plain except for the fact that the 67 per cent of the crossings, at which no accidents occur, are not always the same particular crossings.

In other words, there are a large number of crossings of relatively light traffic density where the lightning of traffic accidents seldom strikes twice. These infrequent accidents, when they do occur, may be serious, and perhaps appalling and then may never happen again in the history of the crossing.

OTHER CONSIDERATIONS GOVERN

For this reason it is necessary to estimate the probability of such accidents at a crossing, and then to decide if they can be prevented by additional protection, by realignment of the approach roads, or finally if a separation can be built at a small enough cost to justify it. However, we see that it is necessary to confine ourselves to a limited number of relatively important crossings if we are to materially reduce the hazard to traffic with a reasonable expenditure of public money.

It is doubtful in many cases, if concern for human safety is the chief consideration in our minds when asking for the separation of some particular crossing. Very often we are in a hurry to get somewhere and find ourselves sitting at a crossing watching a long freight train drag by. If this happens too frequently we are likely to demand that some steps be taken to do away with this delay, which usually requires a separation of grades at the crossing.

Even if you are one of those happy individuals who can remain content under such circumstances—perhaps by counting the cars, observing the number of nonpaying passengers, or noting the home railroads on the various box cars—it is doubtful if any human being can remain entirely calm as a switch engine with a cut of cars shuttles back and forth in front of you, alternately arousing hopes that you may pass, and immediately dashing these hopes to the ground by backing up again.

(Continued on page 6)

A DANGER SPOT with a high accident record in the city of Los Angeles where Mission Road crosses the Pacific Electric tracks. The tracks will be raised, permitting traffic to pass under them.

PEAK HOUR PERILS confront motorists at Graham Station on State Route 174 where Pacific Electric interurban trains cross Firestone Boulevard in Los Angeles. The danger will be eliminated by construction of a subway under the tracks.

FOUR TRACK CROSSING of the Union Pacific's Main and Butte Street line on Soto Street in the city of Los Angeles. A subway will provide safety for vehicular traffic.

List of Grade Separation Projects Recommended for Construction

County	Route	Project	Railroad	WPA Funds
Monterey	2	Subway on Main Street in Salinas	S. P.	$294,350 00
Kern	4 and 33	Subway on Golden State Highway at Famoso	S. P.	203,200 00
Tehama	3	Widening Subway South of Red Bluff	S. P.	116,430 00
Alameda	Feeder	Subway on San Leandro Street at 105th Street in Oakland	S. P. & W. P.	372,065 00
Sacramento	Feeder	Overhead on Jibboom Street in Sacramento, connecting with new "I" Street Bridge approach	S. P.	144,580 00
San Joaquin	5	Subway on Charter Way in Stockton	S. P. & W. P.	268,059 00
Sacramento	3	Widening Subway at 16th Street in Sacramento	S. P.	54,200 00
Santa Clara	Feeder	Subway on Lafayette Street connection to Bayshore Highway in Santa Clara	S. P.	171,860 00
Alameda	69	Overhead on East Bayshore Highway at El Cerrito Hill in Albany	S. P.	352,050 00
Santa Clara	Feeder	Subway on Almaden Road, San Jose	S. P.	97,770 00
Santa Barbara	Feeder	Rebuilding old Overhead on Los Positos Road in Santa Barbara	S. P.	14,370 00
Monterey	2	Subway on Coast Highway is Soledad	S. P.	150,870 00
San Joaquin	5	Subway on State Highway East of Tracy	S. P.	203,590 00
Riverside	26	Overhead on State Highway north of Indio	S. P.	128,800 00
Los Angeles	165	Bridge and Overhead on the Figueroa Street Extension in Los Angeles	S. P.	703,900 00
Los Angeles	Feeder	Overhead on Soto Street in Los Angeles	S. P.	208,580 00
Santa Clara	Feeder	Subway on Embarcadero Street, Palo Alto	S. P.	221,280 00
Imperial	27	Subway on Main Street in El Centro	S. P.	231,110 00
Alameda	5	2 Grade Separations on Revision of State Highway Alignment at Niles	S. P. & W. P.	388,188 00
San Francisco	Feeder	Reconstructing subway on Army Street in San Francisco	S. P.	60,900 00
San Francisco	Feeder	Reconstructing and Widening Overhead on Williams Street in San Francisco	S. P.	57,050 00
Riverside	19	Reconstructing Overhead on new Alignment Jack Rabbit Trail West of Beaumont	S. P.	104,925 00
San Diego	2	Widening Overhead North of Del Mar	A. T. & S. F.	41,640 00
Los Angeles	9	Subway on Foothill Boulevard at Azusa	A. T. & S. F.	249,620 00
Contra Costa	Feeder	Reconstructing old Overhead near Maltby	A. T. & S. F.	16,250 00
Fresno	4	Overhead on Golden State Highway at Calwa, South of Fresno	A. T. & S. F.	222,960 00
Los Angeles	60	Overhead on Relocated State Highway Route via N & O Streets near Wilmington	A. T. & S. F.	270,520 00
Los Angeles	167	Subway on Atlantic Avenue near Hobart Station	A. T. & S. F.	179,800 00
San Bernardino	31	Subway on State Highway at Verdemont, North of San Bernardino	A. T. & S. F.	86,550 00
Orange	171	Subway on State Highway at Northam Station, Buena Park	A. T. & S. F.	164,230 00
San Bernardino	58	Overhead on State Highway near Java	A. T. & S. F.	96,040 00
Los Angeles	174	Subway on Firestone Boulevard at Graham Station	P. E.	416,330 00
Los Angeles	Feeder	Raising tracks at Intersection of Mission Road and Huntington Drive in Los Angeles	P. E.	382,320 00
Los Angeles	Feeder	Subway under Main and Butte Street Line of Railroad on Soto Street in Los Angeles	U. P.	227,660 00
Alameda	105	Removal of Railroad track from 12th Street in Oakland	W. P.	50,414 00
Alameda	69	Washington Avenue Subway, South of San Leandro	W. P.	181,575 00
Alameda	105	Subway on Jackson Street in Hayward	W. P.	168,550 00
Alameda	Feeder	Rebuilding Subway on Mountain Boulevard in Oakland	S. N.	59,468 00
Alameda	Feeder	Subway on Broadway Terrace near Landvale Drive in Oakland	S. N.	124,292 00

A DOUBLE DANGER is encountered at Calwa where the Santa Fe railroad crosses the Golden State highway and the Southern Pacific tracks at grade. An overhead structure will be provided for motor vehicles.

GRADE CROSSING on "S" curve at Delano on the Golden State highway. This bad situation is being corrected with a realignment of the highway and construction of an underpass.

UNDER CONSTRUCTION. Both railroad and highway have been detoured to permit building of the Delano underpass. The new highway alignment, partially graded, is seen following along the cut embankment. Traffic is using the detour at right of picture.

Grade Separation Projects Total 39

(Continued from page 2)

DELAY AND COST FACTORS

Hence, it is plain that the other important factor governing the choice of railroad grade separation projects is delay to highway traffic.

During the past few years, the railroads and the Division of Highways have studied the amount and cost of delays at numerous crossings on the State Highway System and have found that on a large per cent of the crossings, the time that traffic is delayed, and the cost of this delay based on any reasonable assumption, is relatively small. They found, however, that on main trunk highways and particularly on important city streets where the total project cost is not unusually high, it is decidedly worth while to build a grade separation to end such delays.

The difficulty which faces us in solving the problem of traffic hazards and delays at railroad grade crossings is, therefore, that we are only justified in separating the grades at crossings on important trunk highways and city streets when this can be done at a reasonable cost, but due to the usual difficulties connected with such crossings in more or less settled areas, the cost is likely to be anything but reasonable.

COLD-BLOODED VIEW

Looking at the matter from a cold-blooded business view point, it is not just the actual amount of traffic or the number of accidents occurring at a grade crossing which decides the need for separation; it is the saving that will accrue to the traveling public from elimination of delays and accidents per dollar of cost of the separation.

Sometimes, due to topographic or other conditions, a separation can be provided on a highway carrying moderate traffic at a relatively low cost, making the project justifiable from an economic standpoint but on the other hand, some of the most important and dangerous crossings in the State are practically impossible of separation due to the huge expenditure that would be necessary to practically remodel the adjacent land with the improvements on it, in order to take care of the adverse effect on existing business facilities, and on property values.

EMPLOYMENT RESTRICTIONS CHANGED

Federal regulations originally required that, in constructing grade separations through the use of these funds, 90 per cent of the labor must be taken from the relief rolls and at least 40 per cent of the cost of the project should be expended for labor. The first of these requirements would have restricted the choice of projects to only those close to large centers of population but it was rescinded some time previous to the preparation of a recommended list of projects mentioned above. The Government now requires only that labor be obtained through the U. S. Employment Service, as is done at the present time, with preference given to those persons now on the relief rolls.

It was known that the average cost of labor on separation projects on State highways was well below the 40 per cent required by the Federal regulations, and in order to comply with this requirement studies had to be made as to types of structures which would require the maximum of local labor.

To comply with this regulation it was proposed that the cost of labor would equal the required 40 per cent, which in practically all cases would have added to the total cost of the project. It was found also, that on account of this restriction, it would be practically impossible to do any work of placing additional protection at existing grade crossings.

THIRTY-NINE PROJECTS PROPOSED

This was the situation just previous to the time that advice was received from the Federal Government to submit a recommended list of grade separation projects which could be gotten under way by December 15th. The 40 per cent labor restriction was removed a few days previous to the submission of this recommended list of projects, but there was not time to consider any program for additional crossing protection or to materially alter the choice of projects which it was proposed to include under the original set up.

The list of projects submitted to the bureau for approval and printed here in connection with this article comprises 15 projects on State highways outside of cities, 10 projects on State highways within cities, 12 projects on other city streets, and two projects on county roads; a total of 39 individual projects, all of which include one or more grade crossing separations and such

(Continued on next page)

20 Mile Section of San Simeon-Carmel Highway Not Open

IN AN EFFORT to clear up misleading information which concerns public travel along the Coast Highway between San Luis Obispo and Monterey, District Engineer L. H. Gibson of District V, Division of Highways, presents the following facts:

"* * * This route, also known as the Roosevelt highway and the Carmel-San Simeon highway, is still in the state of road and bridge construction.

SLIDES IN MOTION

"There are many narrow and steep stretches of road work along the route that are extremely hazardous. Several slides are still in motion, with consequent danger of rocks rolling down and striking cars. For these reasons and because of interference with construction activities, the Division of Highways can not permit the public to pass over this portion of the highway, a distance of about 20 miles.

TWENTY MILES CLOSED

"Anybody wishing to view the completed portions of the Roosevelt highway may do so. It is open for 40 miles south of Monterey and for 80 miles north of San Luis Obispo.

Signs and gates are in place to prevent travel over the remaining 20-mile section still under construction, which will prevent anyone from making a continuous trip between the terminal points."

AUTO PRODUCTION FIGURES SHOW 20 PER CENT INCREASE

Motor vehicle production by members of the Automobile Manufacturers Association for the first eight months of this year was 20 per cent above that for the corresponding period last year.

The output of association members for the first eight months of this year was placed at 1,969,816 units. This compares with 1,641,949 vehicles produced in the January-August period of 1934.

August production, the association reported, was 178,166 units. While this was a decrease of 30 per cent under the July production, it was a 7 per cent increase over the output for August of last year.

The figures cover the operations of all but one of the major automobile companies in the United States.

RECORD CLOSED CAR PRODUCTION

Last year's total production of closed cars in the United States and Canada was 2,242,874, 98.8 per cent of all cars produced and the highest number and percentage in the history of the industry.

LITTLE STORY ABOUT THE DRIVER WHO FORGOT TO STOP, LOOK AND LISTEN

Here's a little story from Traffic Tidings, a publication devoted to the problems of the railroads:

He brushed his teeth twice a day with a nationally advertised tooth brush.

The doctor examined him twice a year.

He wore rubbers when it rained.

He slept with the windows open.

He stuck to a diet with plenty of fresh vegetables.

He relinquished his tonsils and traded in several worn-out glands.

He golfed, but never more than eighteen holes.

He never smoked, drank or lost his temper.

He did his daily dozen daily.

He got at least eight hours' sleep each night.

The funeral will be held next Wednesday.

He is survived by eighteen specialists, four health institutes, six gymnasiums and numerous manufacturers of health foods and antiseptics.

HE HAD FORGOTTEN ABOUT TRAINS AT GRADE CROSSINGS.

Grade Crossing Projects

(Continued from preceding page)

road connections as may be necessary in order to construct them properly.

The Division of Highways, in submitting this list, expects that through savings on estimated costs, or through unforseen difficulties in getting some of the listed projects under way, it will be found necessary to add or substitute other projects at a later date.

It is realized that, due to the limited amount of funds and other restrictions, many worthy projects of practically equal importance have to be omitted. The present list, however, is the result of careful consideration on the part of the Division of Highways and it has received the approval of the various railroads concerned, the district office of the Bureau of Public Roads, the State Director of the National Emergency Council and the State Administrator of the National Works Progress Administration, whose approval is required.

In order to get as many contracts as possible on this work awarded by December 15th, the Highway Department is putting forth every effort in order to clean up the preliminary details and prepare the plans, and expects to have a large proportion of the work under contract at that date.

Bay Bridge Cables Get a Squeeze; All Channel Piers to Have Bells On

ONE of the most interesting tasks involved in the construction of the San Francisco-Oakland Bay Bridge now is being accomplished by the builders of the gigantic structure.

This job is the "squeezing" together of 17,464 wires into a compact, unbreakable cable. Two of these huge cables will cross from San Francisco to Yerba Buena Island and will carry the suspended weight of the bridge itself.

Each of these cables will be made up of 37 strands of 472 wires each, held together by soft sheet metal bands making a total of 17,464 wires to a cable.

SQUEEZED BY RADIAL JACK

Work of compressing the north cable extending from the west shore to the Center Anchorage will be undertaken first, to be followed by the "squeezing" of the south cable.

Upon the loosely laid wires spun from the shore to the Anchorage, a compacting machine travels, "squeezing" as it moves along. This machine, known as a radial jack, brings to bear on the 37 strands of wires the pressure of six 75-ton jacks which form a circle about the cable.

The chain drive of these six jacks compresses the 37 strands into a tightly compacted cable 28¾ inches in diameter.

The present cable has a somewhat hexagonal shape and is about 29 inches in width and 34 inches thick. The first compacting began this week from the top of Tower W-2. Six 75-ton jacks in each compacting machine, driven by air motors, will squeeze the cable, and temporary seizings or short spiral wrappings will hold the cable in its compacted form.

FOUR SUSPENDER ROPES

After the entire cable has been squeezed to size, and seized at intervals, and cable bands bolted on to supply grooves for the hanging of the suspender ropes, the compacting machines will be taken off.

The next operation will be to disengage the four 2¼-inch suspender ropes from the catwalks, leaving the catwalks supported by the main cables. The four ropes, of wrist thickness, which will be taken down will be cut up into lengths already marked off, and dropped over the main suspension cable in grooves provided in the cable bands.

To the ends of these suspender ropes, ranging in length from six feet to 230 feet, will be attached the trusses, or the decks, of the bridge. These trusses will be hoisted up by hoisting equipment suspended from the cables. The sections of trusses will be barged into position underneath the cable and from there lifted and secured to the suspenders.

WRAPPING FINAL JOB

After the decks, or the stiffening trusses, of the bridge have been suspended by means of the former catwalk ropes, paving will then be placed on the upper deck and on the truck lane. Thereafter when the bridge is fully loaded, the business of wrapping the cable will begin.

The cable is not wrapped until the total dead load is applied because only then has all the stretch been taken out of it.

Immediately before wrapping, a red lead paste will be applied to the cable. Then the cable is completely wrapped with steel wire except beneath the cable bands where the cable has been previously treated with red lead paste before the bands are bolted on.

CATWALKS REMOVED LAST

At the anchorages, huge splay castings will be applied to the cables before the wrapping, which will graduate the size of the cable from its fan-shaped spread at the eyebars to its closely compacted load-carrying size. After being spirally wrapped with wire, the cable will be given four coats of paint.

Almost the last operation of the bridge will be the removal of the catwalks along the cables.

Work on the bridge is well ahead of schedule, according to Chief Engineer C. H. Purcell, and the transfer of cable spinning equipment from the western to the eastern catwalks was started a week ago.

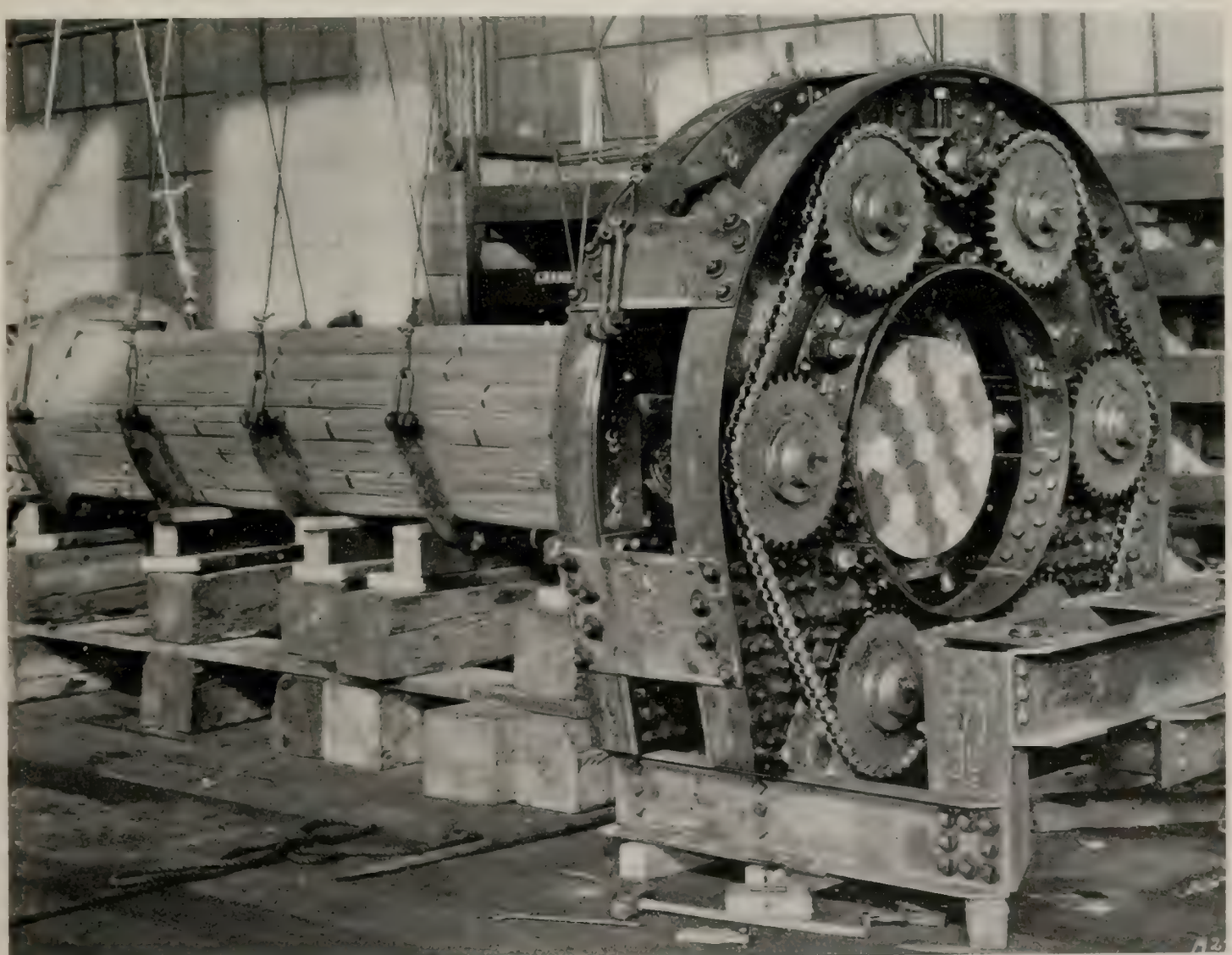
BELLS ON THE BRIDGE

When cable spinning on the eastern catwalks is completed, compacting of the giant cables from the Center Anchorage to Yerba Buena Island will begin.

Another interesting feature of the bridge equipment is a set of five huge bells which

(Continued on page 29)

SO BIG! The two Bay Bridge workers are obligingly hugging one of the big cables to give an idea of its size before the compacting machine comes along and gives it a big squeeze.
Photo courtesy of San Francisco Examiner.



JACK THE SQUEEZER. After the 17,464 wires making up the 37 strands are in place the cable has a somewhat hexagonal shape 29 inches in width and 34 inches thick. The radial jack compacting machine squeezes the cable to a circular form $28\frac{3}{4}$ inches in diameter.

State Cooperation in the Improvement of Highways and Streets in Cities

The following article includes excerpts from an address by Director Earl Lee Kelly of the Department of Public Works before an assemblage of city mayors and councilmen at the annual convention of the League of California Municipalities in San Francisco September 24, 1935, in which he discusses the additional one-quarter cent gas tax allocation to cities by the 1935 legislature increasing the cities' share to approximately $12,000,000 a biennium; the effect on the State highway budget and city taxes; the application of the money to State highways and major streets within cities and the resultant problems confronting the Division of Highways.

By **EARL LEE KELLY,** Director of Public Works

PRIOR to 1933, the expenditure of gas tax revenue by the State was, by statutory control, almost entirely on rural State highways. At that time the State's expenditure was limited to those roads officially designated as State highways.

EARL LEE KELLY

There was no specific provision in the law to extend the State highways into or expend the gas tax within municipalities. As a consequence, the Highway Commission generally halted the State highways at the city limits, except in the case of a few of the lesser populated cities and in sparsely populated areas of the larger cities.

While comparatively little gas tax money found expenditure within the cities, the amount was, however, fully commensurate with the mileage of highways under control of the State.

EXTENDED INTO CITIES

Since 1933 the scene has changed. The State has been granted authority to extend its highway routings within and through incorporated cities, regardless of size. We have witnessed the culmination of a measure of which this league is the parent and which has brought, if not a more comprehensive, then surely a more equitable view of the distribution and expenditure of gas tax revenue.

We now have legislation by which we can comprehend the State Highway System, not as a disjointed system of roads broken and terminated at each city boundary, but as a potential system for providing a continuous and a direct thoroughfare improved to adequate traffic standards, through our cities. The barriers to expeditious passage that confronted the motorist of only a few years past have been broken.

No longer will the motorist on a State highway find himself, as you might say, deserted at the city limits and confounded with the difficult problem of navigating his passage through a city which for any number of reasons did not possess the resources to provide streets of a standard adequate for present-day traffic.

CITIES ACCEPTED CHALLENGE

We say that no longer must these conditions prevail. By that we mean to recall the challenge that the municipal officials of California accepted two years ago to provide this

(Continued on next page)

State Pays Half of Cities' Annual Street and Highway Expense

(Continued from preceding page)

motorist with a passage through the cities with as much facility as the State has afforded in his movement to the cities' door. That the officials have both the disposition and the capacity to satisfy this challenge is evident by their endeavor and their success in compounding this challenge in the recent legislature.

We now have legislation, enacted during the last session as Senate Bill No. 561, which increases the gas tax allocated for expenditure within cities by one-fourth cent per gallon. This act supplements the previous act of 1933, which provided one-fourth cent per gallon of the gasoline tax for expenditure upon the State highway routes within cities.

By the terms of the 1933 Act, the gas tax was to be expended, primarily, upon the State routes, and in the event the amount of money apportioned for any one city was greater than necessary to maintain and improve to adequate standards all State highways within the city, the surplus could be expended on other streets of major importance.

The increased amount to be allocated by the new legislation provides one-fourth cent to be expended upon streets of major importance within the city other than State highways, as may be agreed upon by the department and the legislative body of the city.

CITIES GET $6,000,000 YEARLY

One-quarter cent of gas tax revenue is estimated to yield, in round figures, $3,000,000 per year. Thus, under the gas tax allocation, there will be $3,000,000 per year for State highways within cities, and $3,000,000 for city streets other than State highways, or a total of $6,000,000 to be expended annually within the cities.

Represented in terms of tax rate, the revenue of the one-half cent to be expended within your cities is the equivalent to a tax rate of $0.11½ per $100 of assessed valuation within the municipalities.

This figure is taken from information recently published by the State Controller for the fiscal year ending in 1934, the latest information available. From this information it is calculated that the average tax rate for all the cities within the State amounts to $1.72¾ per $100 of assessed valuation.

Again quoting from the Controller's report, the total expenditure by municipalities during the fiscal year ending in 1934 on highways, roads and streets within incorporated cities, in round figures amounted to $15,600,000. This figure includes, in addition to maintenance and repair, construction and improvement of streets, roads and highways, the cost of street lighting, which during the year amounted to $3,500,000.

STATE PAYS HALF

Thus the net amount expended upon streets and roads within municipalities, attributable as of primary benefit to vehicular traffic, and excluding the cost of street lighting, amounted to $12,000,000.

The $6,000,000 per year of the gasoline tax to be expended on State highways and city streets within municipalities will amount to practically one-half of the expenditures by all cities for streets and highway purposes.

This relates only to the gas tax allocation required by law. It does not take into consideration any additional gas tax money that the Highway Commission may budget for construction within incorporated cities, or of any Federal Aid funds available to the Highway Commission which may be so apportioned.

SAVES TAXPAYERS' MONEY

This, we submit, is an appreciable measure of State cooperation within municipalities. The prevalence and the benefits of this cooperation become more striking when we consider that of the total population in California, 75 per cent resides in these cities. The expenditure of gas tax money within cities provides an improvement or service for which these residents would otherwise have to pay in the form of city taxes or by presenting the possibility of a reduction in the city tax rate, or both.

Up to this point only the matter of funds to be expended within cities under legislative mandate has been discussed.

In addition to the State gas tax funds, California's share of the $12,800,000,000 Federal Emergency Relief appropriation of 1935 for highways amounts to

(Continued on page 22)

GASOLINE CONSUMPTION SLUMPS IN STATES THAT INCREASE TAX

Gasoline consumption in Pennsylvania dropped 20,000,000 gallons during July, the first month of the increased gasoline tax in the State, according to the report of the director of the Bureau of Liquid Fuels Tax. The drop amounting to 17 per cent, occurred in the face of increased consumption in every state with the exception of Delaware, which also increased its tax one cent a gallon on July 1.

The experiences of Pennsylvania and Delaware with increased gasoline taxes are substantially the same as that of New York and Nebraska, two other states which increased their levies on motor fuel this year. In New York, where the state tax was raised one cent a gallon on April 1, consumption in every subsequent month fell below that of the corresponding month in 1934. Consumption in Nebraska, which raised its tax from four cents to five cents on March 1, has also shown a decrease from the year before each month with one exception.—*Petroleum Industries.*

Construction Progress and Pavement Records Made During the Year 1934

By EARL WITHYCOMBE, Assistant Construction Engineer

A greater effort was concentrated in the selection of material for the immediate subgrade for pavements, during the past season's work. Complete soil testing equipment has been set up in five of the eleven districts and they are now in a position to perform their own routine testing.

For the remote districts, this procedure materially speeds up the decision relative to treatment of soils and has worked out very advantageously. The construction personnel are becoming more familiar with the identification of questionable materials, and the danger of such material not being recognized and used without testing is considerably lessened.

The test of soil quality to which most significance is attached is the bearing value. In this test the bearing value of the soil is compared to that obtained with a good crushed rock surfacing, and is reported in percentages.

The test is made on the material in a saturated condition as well as with a normal moisture content. For pavement subgrade, the material must show a bearing power of not less than 10 per cent of that obtained in a saturated condition.

CORRECTIVE MEASURES

The proposed project is investigated as to soil conditions during the preliminary planning stage and wherever possible a complete soil profile is obtained. From this information the decision is made as to the corrective measures to be taken.

Should the bearing value fall below 10 per cent, the grade is blanketed with from 8 to 24 inches of selected material which will meet the above requirement, the depth depending upon the quality of the underlying material. Under pavements subject to leakage of surface water, a membrane of "E" grade asphalt is applied to the surface of the objectionable material before blanketing with selected material.

PORTLAND CEMENT CONCRETE

Construction Records.

The maximum average daily output of concrete by a single 27E paver, on the basis of an 8-hour day, was placed on Contract 67XC1, in Los Angeles County, between Orange Avenue and Barranca Street, where Oswald Brothers placed 459.5 cubic yards per day.

The resident engineer was G. E. Farnsworth and the street assistant, T. A. Roseberry. The average daily output per mixer for the State during 1934 was 402.0 cubic yards, as compared to 390.6 cubic yards in 1933.

The maximum average output for two pavers was on Contract 64TC4, in Santa Clara County, Lawrence Station Road to Alviso-Santa Clara Road, where Basich Brothers laid 933.0 cubic yards per 8-hour day. The previous year's record was held by the same contractor on an adjoining project where an average of 914.1 cubic yards was laid per day.

HIGH MIXER EFFICIENCY

This average for two-mixer operation also exceeds the above average of a single mixer for each of the two used on this project and represents 97.2 per cent efficiency as based on the maximum yardage obtainable without any delays whatsoever during the elapsed time of operation. The resident engineer on this project was W. A. Rice and his street assistant was E. Carlstad.

Pavement Quality.

The strongest concrete pavement placed during 1934 was on Contract 67XC1 which also has the record average daily output for one paver as mentioned above, in which the average compressive strength was 5686 pounds per square inch. The average for the State was 4465 pounds as compared to 4675 pounds for 1933.

It is worthy of mention that on Contract 65VC5 and 65VC6, in Santa Barbara County from the east city limits of Santa Barbara to Hollister Avenue, a base course was constructed of Class "C" concrete with 4.2 sacks of cement per cubic yard as compared to six sacks in other projects, and the average compressive strength was 2987 and 3074 pounds respectively. The contractor on both the projects was J. E. Haddock, the resident

TWO PAVERS working on 40-foot portland cement project on Bayshore Highway in Santa Clara County

engineer, H. J. Doggart and his street assistant, T. F. Baun.

CEMENT CONTROL RECORD

The record for **cement control** was made on Contract 67XC5, in Los Angeles County, Evergreen Avenue to Atlantic Boulevard, with an average variation of 0.34 per cent; the contractors were Jahn & Bressi, the resident engineer, C. N. Ainley, and the street assistant, G. H. Lamb. The average variation for the State was 0.90 per cent as compared to 0.80 per cent for 1933.

The record for **surface smoothness** was obtained on Contract 65VC3, in Santa Barbara County, Arroyo Hondo to Gaviota Creek, where the average roughness per mile was 4.7 inches. The contractors were Weymouth Crowell Co., the resident engineer, V. E. Pearson and the street assistant, F. C. Weigel. The average for the State was 8.3 inches, compared to 9.4 inches in 1933.

Construction Methods and Design

The 16-foot floats were used throughout the season's work and are now standardized on all work. On Contract 67XC1, a 20-foot float, used diagonally across the 10-foot strip and towed by means of a light car, was developed by G. H. Lamb as a substitute for the longitudinal float. The speed with which a long section of fresh concrete can be covered and the uneven subsidence eliminated is remarkable. This float met with immediate popularity both with inspectors and floatmen. It was used throughout Contract 65VC3, the project having the smoothness record for the season, and is now an alternate method in the Standard Specifications. This has been used successfully on 20-foot width of pavement by floating one-half the width from one shoulder and the other half from the opposite shoulder. A car, truck, tractor and a mule or horse have been used successfully as motive power for this float.

Reinforcement.

Two pavement projects in 1934 deviated from the conventional design of two longitudinal deformed-edge bars placed in a vertical plane, by substituting a single round greased bar. One project was reinforced throughout with wire mesh placed in flat mats 16 feet in length.

Joint Construction.

Spacing of expansion joints has been varied in this season's projects, being 60, 90, 100 and 120 foot intervals with intermediate weakened plane joints. The panel lengths were 20 feet and 30 feet with about equal mileage of each length. One project had nonuniform panel lengths, the expansion joints being at 90-foot intervals and intermediate panel lengths being 26, 34 and 30 feet. The intent of this spacing is to prevent synchronized vibration in vehicles, should slab curling take place.

Curing.

This season's work marked the beginning of the use of colorless membrane for curing

(Continued on next page)

Improved Method Devised for Grouting

(Continued from preceding page)

concrete pavements, and several projects were cured in this manner.

ASPHALT CONCRETE

Construction Records.

The **maximum average daily output** was obtained on Contract 64TC5, in Alameda and Contra Costa counties between Ashby Avenue and Potrero Avenue, with 950.0 tons per 8-hour day. The contractor was the Peninsula Paving Co., the resident engineer was L. G. Marshall and his street inspector, W. Thomas. The average daily output for the State was 594.4 tons, while in 1933 it was 663.6 tons.

Pavement Quality.

The best **average stability** of surface course mixture, 3900 pounds, was obtained on Contract 511VC1-611VC5, in San Diego County, Encinitas to Oceanside. The contractor was Griffith Company, the resident engineer, T. W. Voss, and his street assistant, I. W. Littlefield. The average stability for the State was 2950 pounds as compared to 3026 pounds in 1933.

The **smoothest surface finish** was obtained on Contract 67VC12 in Los Angeles County, West Channel Road to California Avenue, being 10.0 inches per mile. The contractor was Oswald Brothers, the resident engineer, E. L. Seitz and his street assistant, A. W. Carr. The State average was 21.4 inches per mile, compared to 14.9 inches in 1933.

Construction Methods and Design

Considerable mileage of the 1934 construction was resurfacing within municipalities. This type of work was new to the organization and much of it was hand spread, which was not conducive to smooth-riding work. On the hand-raked sections a 16-foot float was used identical with the float used to finish Portland cement concrete, which was a decided improvement. On the later work, machine finishing of the main traffic lanes was accomplished, with hand raking of the gutter strips.

District VII developed a method of grouting between the header and the existing base on Contract 67VC3, W. J. Calvin resident engineer, with a lean dry mortar that sets up sufficiently in four hours time to carry the weight of the finishing machine without displacement. This was a decided improvement in maintaining a uniform cross-section in resurfacing by machine methods.

Mixture Design.

Sands and fillers are subject to approval by our testing and research laboratory prior to use on the basis of stability in the Hubbard-Field machine, and the results of this test also furnish the field engineers with the laboratory recommendation of the proper amount of asphalt to be used with the particular material involved.

A very interesting section of work was completed in 1934 in the city of Santa Barbara under Contracts 65VC5 and 65VC6, in which a lean mixture of Portland cement concrete base was surfaced with a natural asphalt sand mix. The asphalt sand was obtained from a deposit on the beach line near Carpinteria. It was excavated with a power shovel and thrown into an immense stockpile to cure, which process equalizes the asphalt content.

HEATED IN DRYER

During mixing operations the asphalt sand is heated in a special type of dryer, elevated to a hopper above the weigh box on a conventional asphalt paving plant, weighed out with the heated aggregate and cold filler and mixed in the pug mill. Crushed porous sandstone was used for coarse aggregate and limestone dust for filler. The sand portion of the mixture consisted of the aggregate in the natural asphalt.

The grading of the mixture was very similar to Type "B" asphaltic concrete. As the character of the mix more nearly resembled an oil mix, stabilities were recorded on the plastometer. The riding qualities obtained on this work were very satisfactory.

OILED ROCK SURFACING

The plant mix type again predominated in 1934, 83.2 miles having been constructed, as against 41.9 miles of road mix.

The record for smoothness for plant mix, 8.2 inches per mile, was obtained on Contract 59VC2 in Inyo County, Dougherty's Corner to Birchim Canyon; the contractor was Basich Brothers and the resident engineer,

SLOAT BOULEVARD, San Francisco County, with 40-foot asphalt concrete pavement and 16-foot portland cement concrete widening.

JUNIPERA SERRA HIGHWAY in San Mateo County with 40-foot pavement of asphalt concrete.

A. C. Briney. The State average was 26.4 inches compared to 23.5 inches in 1933.

For the road mix type, the smoothest job was Contract 69VC1, with 6.5 inches per mile, in Mono County, between 2 miles north of Leevining and Mono Inn; the contractor was Isbell Construction Co. and the resident engineer, M. W. Ellis. The State average was 27.3 inches as compared to 34.4 inches in 1933.

SEVENTY PER CENT CUT-BACK ASPHALT

Approximately 70 per cent of the total mileage of plant and road mix was built of cut-back asphalt as compared to 30 per cent with fuel oil.

In the city of Santa Cruz, a project was laid under Contract 64TC7 using 2 inches of natural rock asphalt as a surface on a 6-inch crusher run base. The rock asphalt was obtained from a deposit in the Santa Cruz Mountains, the mixture being spread with blade graders. One project was constructed during the season of emulsified retread, and one project of emulsified penetration macadam.

Tabulation of Paving Construction Records

PORTLAND CEMENT

Location	Contractor	Resident engineer
At Red Bluff	Hein Bros. & Basalt Rock Co.	J. C. Young
Loomis to Newcastle	T. M. Morgan Co.	J. D. Greene
Through Emeryville, Oakland, Albany, El Cerrito	Peninsula Paving Co.	L. G. Marshall
College Ave.-Page Mill Road	A. J. Raisch	W. A. Rice
Lawrence Sta. Rd.-Alviso-S. Clara Rd.	Basich Brothers	W. A. Rice
Sloat Blvd., Great Highway-19th Ave.	Eaton & Smith	H. S. Payson
Pismo-San Luis Obispo (portions)	M. J. Bevanda	J. M. Hayden
Arroyo Hondo-Gaviota Creek	Weymouth Crowell Co.	V. E. Pearson
At Elwood Crossing	United Conc. Pipe Corp.	T. F. Baun
Summerland-Sheffield Drive	Kovacevich & Price	W. Mathews
E. City Lim.-Los Olivos St.	J. E. Haddock	H. J. Doggart
Mission St.-Hollister Ave.	J. E. Haddock	H. J. Doggart
Oak Glenn-1 Mi. N. of Grapevine Sta.	Griffith Company	F. M. Reynolds
Santa Clara River-Castaic School	Griffith Company	E. L. Seitz
Orange Ave.-Barranca St.	Oswald Brothers	G. E. Farnsworth
Evergreen Ave.-Atlantic Blvd.	Jahn & Bressi	C. N. Ainley
State St.-Fickett St.	Byerts & Dunn	M. L. Bauder
Olive View-Tunnel Station	J. L. McClain	F. R. Pracht
4 Mi. W. of Westmoreland-Trifolium Can.	Oswald Bros.	R. C. Payne
W. City Lts. SBd-Mt. Vernon Ave.	United Conc. Pipe Corp.	C. V. Kane
Sierra Ave.-Riverside Ave.	C. O. Sparks	J. M. Hollister
Through Bloomington	Griffith Company	J. M. Hollister
		Average

* Widening only.
** Class C concrete with asphalt concrete surface.

ASPHALT CON

Location	Contractor	Resident engineer
Yreka-1.5 Mi. Northerly	Chas. L. Harney	M. Frederickson
Maxwell-Delevan	Hanrahan Company	J. D. Greene
Loomis-Newcastle	T. M. Morgan Co.	J. D. Greene
Wheatland-Morrison's Crossing	A. J. Raisch	W. G. Remington
San Leandro-Oakland	Heafey-Moore Co.	F. W. Montell
Ashby Ave.-Potrero Ave.	Peninsula Paving Co.	L. G. Marshall
Through Emeryville, Oakland, Berkeley, etc.	Peninsula Paving Co.	L. G. Marshall
San Pablo-Pinole	Peninsula Paving Co.	L. G. Marshall
In Valona	Southern California Rds. Co.	L. G. Marshall
Napa St.-Water St., Sausalito	A. J. Raisch	F. W. Montell
Bayshore Blvd.-Mission St. Viaduct	Fay Improvement Co.	C. F. Price
Sloat Blvd., Great Highway-19th Ave.	Eaton and Smith	H. S. Payson
Waterloo St.-Islais Cr. Channel	Eaton and Smith	C. F. Price
Edgemar Rd.-Route 2	McDonald, Jones & King & Bonnett	H. S. Payson
At Gilroy	Union Paving Co.	A. L. Gladney
Gonzales-Chualar	A. J. Raisch	M. H. Hubbs
Olive Mill Rd.-Santa Barbara	P. J. Akmadzich	F. C. Weigel
East City Limits-Los Olivos St.	J. E. Haddock	H. J. Doggart
Mission St.-Hollister Ave.	J. E. Haddock	H. J. Doggart
California Ave.-Echo Ave., Fresno	Valley Paving Co.	F. W. Howard
Tulare St.-Stanislaus St., Fresno	Union Paving Co.	F. W. Howard
Pierce Road-Tank Farm	Union Paving Co.	H. B. LaForge
Hanford-Easterly Boundary	Southern Calif. Roads Co.	C. F. Oliphant
Plaza Garage-Goshen	Basich Brothers	J. W. Cole
Wly. Boundary-2 Mi. S. of Plaza Garage	Union Paving Co.	J. W. Cole
Garfield Blvd.-1st St., Montebello	Oswald Brothers	W. J. Calvin
Santa Clara River-Castaic School	Griffith Company	E. L. Seitz
Sunland-Tujunga	P. J. Akmadzich	M. H. Mitchell
Foothill Blvd.-Alosta Ave.	Oswald Brothers	F. A. Read
Saugus-Williams Ranch	Griffith Company	E. T. Telford
Williams Ranch-Summit	Griffith Company	E. T. Telford
Evergreen Ave.-Atlantic Blvd.	Jahn & Bressi	C. N. Ainley
West Channel Rd.-California Ave.	Oswald Brothers	E. L. Seitz
Ely. City Boundary-Pacific Ave.	Griffith Company	W. D. Eaton
Central Ave.-Alameda St.	Griffith Company	R. J. Hatfield
Sycamore St., Anaheim-Romneya Drive	Griffith Company	H. B. Lindley
Beetox-Santa Clara River	Oswald Brothers	G. E. Farnsworth
Downey-Buena Park	United Concrete Pipe Corp.	E. A. Parker
Pomona-Ontario	Griffith Company	H. O. Ragan
0.5 Mi. S. of Turlock-1 Mi. N. of Turlock	Union Paving Co.	A. K. Nulty
9th St., B St., to P St., Modesto	Heafey-Moore Co.	A. M. Nash
Sand Hills-East Highline Canal	V. R. Dennis Co.	F. R. Baker
Encinitas-Oceanside	Griffith Company	T. W. Voss
1 Mi. N. of San Ysidro-National City	V. R. Dennis Co.	R. C. Payne
Market St.-Broadway	Daly Corporation	J. M. Hodges
El Cajon-1 Mi. Easterly	V. R. Dennis Co.	J. M. Hodges
		Average

* Plastometer tests of field mix and average specific gravity.

for 1934 on California State Highways

CONCRETE PAVEMENT

Street assistant	Average cu. yds. laid per 8-hour day	Average strength of concrete, 28 days, lbs. sq. in.	Average daily variation in cement, per cent	Roughness index, inches per mile	Type of finish
H. F. Caton	201.2	5,366	1.02	8.9	Mechanical
A. S. Hart	257.3	4,930	0.90	6.5	Mechanical
W. Thomas	206.5	4,168	2.60	*	Mechanical
J. F. Jorgensen	284.3	4,429	1.14	7.2	Mechanical
E. Carlstad	933.0	4,833	0.76	11.9	Mechanical
H. W. Purser	362.5	3,947	0.40	17.4	Hand work
L. D. House	293.8	4,423	0.58	9.1	Mechanical
F. C. Weigel	363.0	3,685	0.40	4.7	Mechanical
E. C. Daniel	381.5	5,190	0.50	8.8	Mechanical
F. C. Weigel	228.0	4,388	0.46	20.2	Mechanical
T. F. Baun	398.2	2,987	0.49	**	Mechanical
T. F. Baun	440.6	3,074	0.38	**	Mechanical
F. E. Baxter	448.5	4,564	0.70	7.1	Mechanical
H. D. Johnson	315.0	5,020	1.12	6.1	Mechanical
T. A. Roseberry	459.5	5,686	0.55	6.8	Mechanical
G. H. Lamb	691.7	5,371	0.34	6.2	Mechanical
G. H. Lamb	392.0	3,557	0.94	7.6	Mechanical
H. Johnson	315.6	4,726	0.99	8.8	Mechanical
G. S. Kibbey	235.0	4,309	1.10	13.8	Mechanical
J. M. Cowgill	428.6	4,209	0.81	7.1	Mechanical
B. Nelson	398.7	4,894	0.40	6.5	Mechanical
B. Nelson	314.7	4,207	0.64	6.9	Mechanical
	402.0	4,465	0.90	8.3	

CRETE PAVEMENT

Street assistant	Average tonnage laid per day	Average stability of surface mix, in pounds	Average relative specific gravity of surface mix, per cent	Roughometer index, inches per mile	Type of finish
W. M. Douglas	938.1	3,024	94.4	19.8	Mechanical
H. A. McGagin	934.1	3,250	92.8	20.1	Mechanical
A. S. Hart	436.5	2,918	94.0	18.6	Mechanical
A. S. Hart	393.5	2,992	95.5	15.9	Mechanical
B. Van Delsam	361.7	3,130	92.8	21.9	Mechanical
W. Thomas	950.0	2,830	95.5	37.5	Mechanical
W. Thomas	935.0	2,850	95.3	31.5	Mechanical
W. Thomas	741.0	2,546	97.1	34.0	Mechanical
W. Thomas	323.6	2,900	96.7	30.0	Mechanical
B. Allison	348.0	2,800	95.6	22.9	Mechanical
D. N. Sapp	467.5	2,122	93.7	18.4	Mechanical
H. W. Purser	581.5	2,315	95.0	13.0	Mechanical
D. N. Sapp	487.3	2,825	96.3	30.2	Mechanical
J. R. Witt	553.4	2,713	92.9	13.6	Mechanical
	524.6	2,889	93.9	55.5	Hand work
E. F. Carter	624.1	2,588	96.8	15.2	Mechanical
E. F. Carter	294.6	2,828	97.4	14.1	Mechanical
E. F. Carter	304.9	*33%	2.24	16.9	Mechanical
E. F. Carter	357.6	*32%	2.13	14.3	Mechanical
C. Yost	275.0	2,756	93.7	29.6	Hand work
C. Yost	517.3	3,425	94.2	21.2	Mechanical
W. M. Nett	603.5	2,956	93.6	22.7	Mechanical
W. M. Nett	506.0	2,807	92.9	14.9	Mechanical
P. A. Boulton	546.8	2,550	95.7	18.7	Mechanical
P. A. Boulton	476.0	2,898	93.3	20.7	Mechanical
A. W. Carr	633.7	2,984	96.4	25.7	Mechanical
V. A. Miller	555.4	3,098	94.6	27.9	Mechanical
E. D. Davis	458.1	3,068	95.1	21.0	Mechanical
A. W. Carr	490.0	2,921	98.1	20.3	Mechanical
H. D. Johnson	581.2	3,030	94.3	20.6	Mechanical
P. L. Vaughan	670.5	2,900	94.5	17.0	Mechanical
R. L. Norris	355.5	3,612	99.0	23.1	Mechanical
A. W. Carr	475.4	3,101	96.1	10.0	Mechanical
V. A. Miller	562.8	2,755	91.3	10.2	Mechanical
V. A. Miller	618.3	3,467	44.9	15.6	Mechanical
R. E. Schott	542.6	2,605	93.9	23.0	Mechanical
A. W. Carr	420.9	3,458	95.7	10.6	Mechanical
K. D. Lewis	810.7	2,776	98.1	10.7	Mechanical
W. Ford	585.0	2,365	94.9	34.8	Mechanical
H. J. Webb	638.8	2,900	96.4	19.5	Mechanical
W. B. Graziani	182.1	3,626	94.9	29.0	Hand work
F. A. Pearce	534.8	2,932	94.3	31.6	Mechanical
I. W. Littlefield	925.3	3,900	92.0	17.7	Mechanical
L. E. Crayne	697.4	3,744	92.2	20.4	Mechanical
L. E. Crayne	525.5	3,270	97.9	14.7	Mechanical
L. E. Crayne	467.8	3,310	98.3	15.6	Mechanical
	594.4	2,950	95.9	21.4	

OILED ROCK SURFACE

Location	Contractor	Resident engineer	Roughness, inches per mile
PLANT MIX			
Middletown-Putah Creek	Fredrickson & Watson	A. W. Root	21.6
Boulder Creek-1½ Mi. E. of Bella Vista	Fredrickson & Watson	D. J. Stout	34.3
Pine Creek Bridge approaches	A. G. Raisch	H. M. Sturgis	49.4
1 Mi. W. of Washington Rd.-½ Mi. E. of Summit	A. Teichert & Son	W. G. Remington	27.1
Drum Canal-Yuba Pass	A. Teichert & Son	W. G. Remington	26.3
At Roseville	T. M. Morgan Co.	J. G. Meyer	67.6
D St.-2d St., Marysville	Hemstreet and Bell	J. G. Meyer	29.6
Cloverdale-Hopland	Peninsula Paving Co.	H. A. Simard	24.0
Fairville-Shellville	Peninsula Paving Co.	F. W. Montell	37.1
Cabazon-Whitewater	Oswald Brothers	O. B. Brinkerhoff	50.1
Eschscholzia Ave.	George Herz & Co.	H. O. Ragan	15.9
Arrowhead Springs-San Bernardino	United Concrete Pipe Corp.	D. J. Stout	28.9
Crestview-2.2 Mi. S. of Rush Creek	Southwest Paving Co.	A. R. McCarton	30.5
Point Ranch-Dressler's Corner	Basich Brothers	F. R. Baker	14.0
Dougherty's Corner-Birchim Canyon	Basich Brothers	A. C. Briney	8.2
Across Santa Rita Slough	Valley Paving Co.	A. K. Nulty	56.5
Lodi-4.5 Mi. East	Tiffany Construction Co.	R. H. Lapp	12.9
Black Butte-Blythe	Walter Trepte	J. M. Hodges	38.5
San Diego-Point Loma	Walter Trepte	J. M. Hodges	18.2
		Average	26.4
ROAD MIX			
At Big Canyon	A. Teichert & Son	R. F. Buland	26.9
Carmel River-Carmel	J. L. Conner & K. Kristich	J. M. Hayden	24.3
Santa Ynez River-Santa Ynez	Macco Construction Co.	W. Mathews	31.1
1 Mi. S. of Delano-2 Mi. S.	Granite Construction Co.	C. F. Oliphant	20.5
Between Route 140 and Route 58	Geo. K. Thompson	H. B. LaForge	14.4
Wly. Boundary-0.5 Mi. E. of West Casitas	C. W. Wood	W. J. Calvin	87.5
Westerly Boundary-Camp Cajon	Sharp & Fellows	E. A. Bannister	30.4
Sherwin Hill Summit-Whiskey Canyon	Hemstreet and Bell	A. C. Briney	14.5
2 Mi. N. of Leevining-Mono Inn	Isbell Construction Co.	M. W. Ellis	6.5
Westerly Boundary-3.5 Mi. East	Von der Hellen & Pierson	L. R. Hubbard	24.8
		Average	27.3
MISCELLANEOUS BITUMINOUS TREATED			
N. City Limits-Ocean St., Santa Cruz	Union Paving Co. (Rock Asphalt)	A. Walsh	40.2
1 Mi. N. of Inspiration Pt.-Scotts Valley	Hanrahan Company (Bit. Mac. Asphalt)	A. Walsh	49.5
King City-2 Mi. S. of Greenfield	Jones & King (Emulsified Retread)	J. C. Adams	46.4
In El Segundo	J. L. McClain (Emulsified Bit. Mac.)	L. R. McNeely	45.2
		Average	47.1

Los Gatos-Santa Cruz highway (State Route 5) paved with 40-foot bituminous macadam.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

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Vol. 13 OCTOBER, 1935 No. 10

Weeding Out Death Traps

That men have had to die and whole families to suffer merely because civilization has lacked either the time or the money or the inclination to eliminate all railroad grade crossings, has always been a little beyond the understanding of a thinking person.

After all it is mere child's play for modern engineering to route roadways over or under railroad tracks. And even if the cost were double what it actually is, it would still not be worth a single life. Life can not be reckoned in dollars.

But the end of this paradox is in sight. California has swung into action with the $7,426,952 allotted to this State for crossing elimination. Recently President Roosevelt approved rules to govern the project. The State Highway Department is speedily selecting jobs to be done, and actual work will be under way in short order.

A boost toward prosperity this program will be also, stimulating cement, lumber, steel and other factories, and putting money in the pockets of numerous workers, 90 per cent of whom must be taken off relief rolls.

No other single works relief effort can compare with this one for appropriateness, because no other can correct such an obvious oversight of man in the matter of safeguarding life.

Now, at last, we are on the right track. Let us hope we continue so that in two, or three, or five years every last grade crossing in California will have been wiped out. —*Rosemead Review.*

New Map Shows Late Changes in U. S. and State Sign Routes

THERE have been a number of changes in the State Sign Routes since descriptions and a map showing these routes were originally published in California Highways and Public Works in August, 1934.

Several State routes have been superseded by U. S. Numbered Highways, and they, with other changes, appear on a new map of California prepared by the Division of Highways showing United States and State Numbered Highways.

The State Shield Sign Routes which have been superseded by U. S. Shield signs are as follows:

SHIELD SIGN CHANGES

State Route 71—San Diego to San Bernardino.

State Route 95—San Bernardino to Kern-Inyo Co. Line.

State Route 7—Inyo-Kern Co. Line to California; Nevada Line north of Coleville, and California-Nevada Line near Reno Jct. to California-Oregon State Line, changed to U. S. 395.

State Route 3—Serra to El Rio, changed to U. S. 101 Alternate.

State Route 44—Jct. U. S. 101 near Arcata to Alturas, changed to U. S. 299.

Other changes noted on the map are as follows:

U. S. 399 is from Ventura to Bakersfield via Wheeler Springs, Taft.

U. S. 70 is made coincident with U. S. 60 within California.

U. S. 66 EXTENDED

State Route 440, changed to 44.

U. S. 66 extended from Sunset Boulevard in Los Angeles to Santa Monica via Santa Monica Boulevard.

State Route 24, extended south from Sacramento to Oakland, via Isleton, Antioch, Walnut Creek.

State Route 21 is added near Mission San Jose to Walnut Creek via Sunol, Dublin.

The placing of signs on the designated routes is proceeding as rapidly as consistent with proper logging, and economical handling of the work.

U. S.-CANADA BUILT 2,869,963 CARS

Total motor vehicle production for the United States and Canada during 1934 was 2,869,963 units of which 2,270,566 were passenger cars and 599,397 trucks, states a report. Total wholesale value of these vehicles including parts and tires was $2,493,198,716.

Methods Employed to Correct Slides on the Santa Cruz-Los Gatos Highway

SLIDES which occurred on the Santa Cruz-Los Gatos highway near Inspiration Point caused much trouble and expense to the Division of Highways maintenance forces during last winter and the spring of 1935.

During the early part of December the first signs of slide movement appeared in large cracks in the fill slopes. A crew of men were put to work at once sealing these cracks.

The enormous weight of the fill, which was some 45 feet deep at center line became saturated by heavy rains and subterranean springs and began moving slowly down the mountain side.

BACKFILLING ACCELERATED SLIDE

The crew began backfilling the slide portion in the hope of keeping the fill from going out entirely. It soon became apparent that the additional weight only accelerated the slide movement. The road was then closed and traffic detoured over the old road above the fill.

Test holes were drilled in different locations, varying from 20 to 35 feet in depth, to locate the source of the water which was seeping into the fill. These tests proved water to be present in each of the test holes drilled.

In order to carry off this water a trench was dug on the upper side of the fill by means of a drag line. This trench was dug to a depth of 30 feet and was 150 feet in length by 12 feet in width. This trench was then backfilled with boulders of six-inch minimum diameter and the water was carried off to an adjacent ravine in which a culvert had been previously placed. A perforated metal culvert was also installed across the road just east of the fill.

SLIDE MOVEMENT ARRESTED

These preventative measures were successful in arresting the slide movement. A temporary roadway was then constructed somewhat below grade and thirty feet wide which accommodated traffic during the vacation season. At that time, however, approximately 50 per cent of the fill had slipped a distance of some 300 feet down the mountain side.

On August 2, 1935, work was again resumed and by that time the fill had dried out with the exception of one particular spot where further moisture showed up near the toe of the fill. At this point another trench was excavated in a diagonal direction with a 50 H.P. tractor and bulldozer.

The dimensions of this trench were about 30 feet deep, 12 feet wide and 200 feet long and revealed natural solid ground which was treated with liquid asphalt to seal the bottom of the trench. The trench was then backfilled with six-inch minimum size rock, the rock being placed six feet wide, 10 feet deep and 150 feet long.

ANOTHER SLIDE DEVELOPED

The rock was covered with a heavy mat of brush and pine boughs. The fill was then brought back to grade by use of a power shovel assisted by two five-ton trucks as well as a bulldozer. The roadway was surfaced with a seal coat on a four-inch crusher run base 40 feet wide.

The fill just east of Inspiration Point slide also caused a good deal of trouble as portions of it slid down the mountain taking with it 40 feet of 24-inch corrugated metal culvert, thereby cutting off the use of the remaining pipe.

This pipe was replaced at the same time as one at Inspiration Point. In making this replacement the original pipe was discovered 20 feet under the fill. It was then extended 120 feet and the trench backfilled with rock, which was likewise covered with a mat of brush and pine boughs.

CALIFORNIA SECOND IN AUTOMOBILES

Motor vehicle registration in the United States last year totaled 24,933,403, an increase of 4.6 per cent over the 1933 total of 23,843,591. New York still leads all other states with 2,269,355 registered motor vehicles, while California remains a close second with a total of 2,006,255.

ITALY FIRST IN AUTO DEATHS

Italy was first during 1934 in number of automobile deaths per 10,000 motor vehicles with an average of 54.5, states a report to the Automobile Club of Southern California. The United States was tenth on the list with an average of 12.3, while New Zealand was low with 6.6.

BIG FILL on the Los Gatos-Santa Cruz highway (State Route No. 5) showing where slide occurred threatening to entirely destroy the completed roadway last Spring

LOWER SLIDE AREA where 50 per cent of the fill slipped a distance of 300 feet down the mountain side and was stopped by trenching and backfilling with rock.

Cities' Gas Tax Fund Pays Maintenance

(Continued from page 12)

$15,178,965. Under the regulations governing the expenditure of these funds, not less than 25 per cent shall be applied to feeder road projects outside of municipalities and metropolitan areas not included in State highway systems or Federal Aid highway systems, and not less than 25 per cent to projects within municipalities or metropolitan areas. The remaining funds may be applied to projects on the State and Federal Aid highway systems.

COMPLETE PROGRAM PRESENTED

A program has been prepared by the Highway Commission and submitted to the U. S. Bureau of Public Roads, programming the funds as follows:

State highways	$3,000,000
Within municipalities and metropolitan areas	2,371,595
Feeder roads	2,321,024
Total highways	$7,692,619
Grade crossings	7,486,346
Total	$15,178,965

Funds budgeted by the Highway Commission for construction projects within cities amounting to $1,315,880 and Federal Relief appropriation funds programmed for expenditure in metropolitan areas, amounting to $2,371,555, make a total of $3,690,000 for the biennium, or an average annual amount of $1,845,000.

The latter amount, added to the two one-quarter cent allocations of $6,000,000, will make an annual expenditure of State and Federal funds within cities for street and highway purposes equal to 65 per cent of the total expenditures by municipalities for the same purpose in 1934.

When the new laws passed by the last legislature went into effect on September 15th, it became necessary for the Highway Commission to revise its budget and to take some five million dollars out of proposed highway projects to provide the additional one-quarter cent allocation to cities.

MAINTENANCE BURDEN SHIFTED

In revising the budget the Commission was faced with the necessity of eliminating all appropriations for expenditures within cities from budgeted funds, and limiting such expenditure, to be defrayed from the one-quarter cent allocation for State highways within municipalities due to the necessity of financing Federal Aid projects under the provisions of the Federal Emergency Relief Appropriation Act of 1935.

It likewise became necessary that the cost of maintaining portions of the State highway routes within cities formerly maintained at State expense now be defrayed from the one-quarter cent for State highways. This has been a severe blow to some cities with a large mileage of State highways carrying heavy traffic, and where the State has formerly carried the greater burden of maintenance and improvement.

Due to the limited funds available to the Commission, all future expenditures on State highways within cities will have to come out of the one-quarter cent for State highways, except for those projects in the present budget.

ONLY $6,000,000 LEFT

In the current budget the amount programmed for construction projects, both in rural areas and within municipalities, totals $21,500,000. Of this amount $9,500,000 represents Federal Aid authorized by the Hayden-Cartwright Act, leaving only $12,000,000 of State revenue available for construction work for the biennium, or at the rate of $6,000,000 per year.

The present large mileage of State highways in California, about 14,000 miles, requires a huge outlay each year for maintenance and upkeep. A large mileage of poorly improved secondary highways was legislated into the system two years ago. When these highways were proposed for admittance to the State system we were assured by the various sponsors that no capital expenditure for improvement would be necessary. The true condition of these roads, however, told a different story. We found that, because of improper location, with inadequate, and in many cases no surfacing, these roads require considerable improvement. We found that hundreds of bridges on these routes were in a condition compelling immediate repair, reinforcing and in too many cases almost complete reconstruction, to make them safe for State highway traffic.

IMPROVEMENTS IMPERATIVE

The heavily traveled main trunk highways are burdened with an increasing volume of traffic that, aside from outgrowing the pavement, is creating hazardous conditions in many locations which must be given attention despite the cost. In many locations the cost of maintenance could be reduced materially by improvement or reconstruction, but funds for such expenditures are not available and it is necessary to continue from year to year the outlay of a large amount for maintenance in order to provide traffic with the service to which it is entitled, even though maintenance costs pass the limits of economic tolerance.

With the present revenue proving inadequate, any further reduction would result in serious consequences and would impair the efficiency of the service rendered to transportation by the State highway system.

From this you can fully appreciate the problem we are facing of financing the improvement and maintenance of State highways. One solution is to increase efficiency in administering the funds.

ONE SOLUTION OF PROBLEM

A vast improvement along these lines can be accomplished by the elimination of overlapping duties and duplication of effort. The unified highway plan as presented to the last legislature was

(Continued on next page)

Lighting of Streets Held An Obligation Of Local Community

(Continued from preceding page)

developed to increase efficiency in the expenditure of highway money.

A number of inquiries have been received in regard to the use of gas tax funds for street illumination. Apparently these inquiries were inspired by newspaper publicity relating to the use of gas tax funds for street lighting at the time Senate Bill 822 was signed by the Governor, which created an erroneous impression upon the readers. The act permits the use of the gas tax fund only for such illumination as in the judgment of the department is required for the safety of persons using the streets, roads, highways or bridges in question.

The policy adopted with respect to illumination of State highways is that street lighting is considered an obligation of the local community and that gas tax funds may be used only for lighting tunnels, bridges, subways, viaducts or hazardous locations of a corresponding nature. On the other hand, Senate Bill 561 specifically prohibits the expenditure of the one-quarter cent allocation for street lighting within cities.

THROUGH TRAFFIC STREETS

One of the provisions of the act is that the city and the department agree upon the streets of major importance within the city other than State highways upon which the additional one-quarter cent shall be expended. This provision is considered to mean that the city will select certain streets qualified as being of major importance and that such streets or system of streets will be submitted to the department for approval.

It may be well to state here that the qualifications of a street as one of major importance will be determined by a consideration of the through traffic. It is not expected that a system of streets of major importance when adopted will be eternal. But so long as the law requires that streets of major importance shall be the only ones upon which one-quarter cent funds may be expended, it is expected that expenditures will be made accordingly.

When it may become expedient or desirable that the system of streets of major importance be changed, you may be assured that we will be quick to sanction, if not the first to suggest, a change in the major streets plan. It is recognized that in some of the smaller cities practically all of the through streets are designated State highway routes, and in such cases those streets which are of greatest local importance will be approved as qualified under the law.

PREFER CITIES BE JUDGES

There is a provision in the act to require that expenditure of the one-quarter cent for streets be delegated to a city if the department is satisfied that the city is qualified to do such work in what the act terms "an efficient and economic manner." Although the act imposes the obligation of determining the qualifications of a city upon the department, we expect the legislative body of each city to give us their fullest cooperation and we prefer that the cities be the judge of this question.

I am willing to embrace the proposition that the officials of a city are sufficiently earnest to judge the city's capacity in this respect. I sincerely trust that the cities will take advantage of the provision for delegation of expenditures.

Gas Tax Diversions Breeding Revolt in Ranks of Motorists

By **CHARLES M. UPHAM**, Engineer-Director, American Road Builders Association

THE declared intention of gasoline taxes and motor vehicle license fees was to provide funds for highway and street improvement. These taxes and fees actually are a "ticket" or toll on motorists for their use of highways, and are recognized as fair when they are applied to highway improvement.

Instead of collecting from motor vehicle operators on a basis of so much a mile, Federal and State governments levy gasoline taxes, etc., because they are more convenient to collect.

Motor vehicle owners and operators voiced no serious objection to paying these taxes and fees as long as they were used for highways and street construction and maintenance.

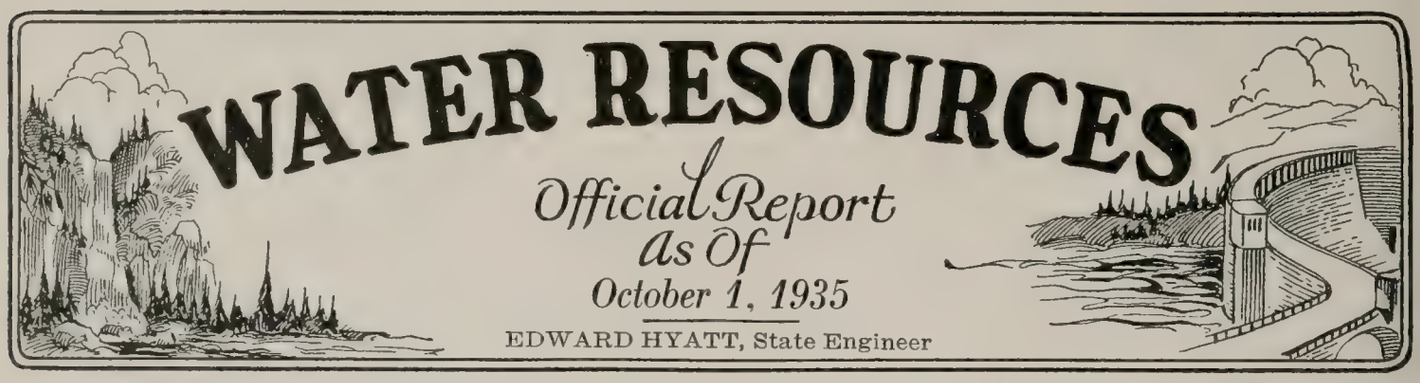
DIVERSION CAUSES REVOLT

But diversion of these funds to other purposes—no matter how worthy the cause or how great the need—is causing motorists to revolt against the taxes and fees, and unless diversion is stopped the highway program will be thrown for a sixteen year loss—right back where it was when the first gasoline tax was levied in 1919.

Every major undertaking breeds its apostles of doom, and the highway program is no exception. From certain sources you hear the cry that there must be a holiday in highway improvement, that the cost of continuing the program is too great, that the taxpayers must have a rest, etc., etc.

LABOR GETS MOST

The answer to that is: Highways and streets are not paved with dollars. They are improved with materials—and labor. The highway dollar does not go out of circulation. It simply changes hands, provides new wealth and permanent benefits. From 80 to 90 per cent of every dollar spent for highway construction goes to labor, labor employed directly on the job, or employed in providing machinery, materials and transportation.



Approval by President Roosevelt of an allotment of $20,000,000 to the Bureau of Reclamation, Interior Department, for construction of the first units of the Central Valley project in California was announced September 12th by the Federal Division of Applications and Information.

Study of plans for irrigation district projects, including the All-American Canal power project of the Imperial District; progress of reclamation and flood control work; applications for construction and repairs of dams and other activities of the Division of Water Resources are detailed in the following monthly report of the State Engineer:

IRRIGATION DISTRICTS

Several days were spent in a field investigation of the Pacheco Pass Water District, located in San Benito and Santa Clara counties, in connection with reports to the California Districts Securities Commission on the feasibility of the irrigation works proposed by the district and the appraisal of the values of the lands included within the district.

A study and review was made of the Imperial All-American Canal power project. The project is proposed by the Imperial Irrigation District for the initial development of the power rights granted by the Federal government to the district in connection with the All-American Canal now under construction. It involves an estimated expenditure of $10,450,000 in the development of two hydro-plants with a total installed capacity of 35,750 k.w., a Diesel stand-by plant of 15,000 k.w. capacity, and the transmission and distribution lines, substations and other necessary equipment for the distribution of electric power in Imperial and Coachella Valleys.

California Districts Securities Commission.

The commission issued orders to the Merced Irrigation District, approving the refunding procedure proposed by the district, and approving for certification by the Controller of the refunding bonds of the district.

An order was issued by the commission authorizing the calling of an election by the directors of the Pacheco Pass Water District on a bond issue in the amount of $200,000.

FLOOD CONTROL AND RECLAMATION

Sacramento Flood Control Project.

At its meeting on September 18, 1935, the Reclamation Board authorized this office to undertake certain incidental construction work in connection with the building of the south levee of the American River Flood Control District from the Meister tract to Mayhew station. This consists of the installation of 12 pipes, construction of several miles of fence, and the anchorage of hop wires, at an estimated cost of $11,000.

Work has proceeded in the construction of the new drainage pumping plants in the Sutter By-pass by Frederick W. Snook Company. The old plants have been almost entirely dismantled and the operators' cottages are well toward completion. The contract provides that a certain pump capacity will be available at each plant at all times to care for emergencies, but it is thought that most of the new pumps will be ready for service in time to care for possible heavy storms.

San Joaquin River.

Surveys have been completed and plans and specifications are being prepared for a closure of three gaps in the San Joaquin River levee of River Junction Reclamation District No. 2064, under the provisions of Chapter 365, 1935. The work will be let by contract, and requests for bids will be advertised on September 24th.

DAMS

Application for construction of an earthfill dam 40 feet in height with storage capacity of 46 acre-feet was made on August 19th by the city of Arcata. The storage is to be used for municipal and domestic purposes. The estimated cost of the dam is $12,000. This application was approved by the State Engineer on September 12, 1935.

Application for construction of tailings retaining dam, 40 feet in height with storage capacity of approximately 40 acre-feet, was filed by the Lava Cap Gold Mining Corporation of Nevada City on August 31, 1935. The structure is to be an earth and rock filled crib and it is estimated to cost $1,000.

Application was filed on September 11th for the alterations of the rockfill dam at Bowman Lake by the Nevada Irrigation District at Grass Valley, California. The work consists of the construction of a parapet wall on the crest of the dam in order to increase the freeboard on the structure.

Dam Repairs and Construction Rushed

Repairs Plans Approved.

Application was filed on August 21, 1935, by the California Edison Company for alterations to the Huntington Lake Dam No. 3. The work consists of placing a fill on the downstream face of the existing concrete gravity dam. This application was approved on September 3, 1935, by the State Engineer.

Application for repairs on the lower St. Helena Dam of the City of St. Helena, was filed on August 30, 1935. The work consists of reconstruction of a portion of the fill to prevent existing leakage. This application was approved by the State Engineer on September 10, 1935.

Construction of the San Gabriel Dam No. 1 of the Los Angeles Flood Control District has been resumed under the revised plans and specifications approved last month.

Excavation for the foundations and outlet conduit for the Grant Lake Dam of the City of Los Angeles, Bureau of Light and Power, is under way.

Construction Under Way.

The Calero Dam of the Santa Clara Water Conservation Water District is nearing completion; the fill is very close to the crest elevation and the work of placing the concrete facing slab is under way. The other dams of the Conservation District are being rushed as much as possible in order to have them completed before the next runoff season.

Construction work at the West Valley Dam in the South Fork Irrigation District, Modoc County, has been chiefly in the excavation for the outlet conduit and the stripping of the foundations.

Work at the O'Shaughnessy Dam, which is being enlarged by the City of San Francisco, consists principally of excavation at the abutments.

The usual inspections for maintenance and operation, as well as of repair jobs under way, has been carried on in addition to the inspection of construction work.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

From a minimum flow of about 3000 second-feet in August, the flow of the Sacramento River at Sacramento has increased to 3800 second-feet due to increased return flow and a reduction in diversions. The flow of the San Joaquin River near Vernalis is 1100 second-feet compared to 450 second-feet at this time a year ago.

The encroachment of salinity into the Delta has been very slight compared to the extensive encroachment of 1934. To date, salinity of 100 parts of chlorine per 100,000 parts of water has not extended above the channels surrounding lower Sherman Island.

WATER RIGHTS

Supervision of Appropriations of Water.

Twenty-nine applications to appropriate water were received during the month of August; 12 were denied and 22 were approved. In the same period two permits were revoked and 8 passed to license.

Among the applications which were received were two of special interest filed on behalf of the North San Juan Ridge area in Nevada County. These applications were to appropriate from South Fork of Middle Yuba River for mining, irrigation and domestic purposes, one application being in the name of W. P. Clerkin of French Corral and the other being in the name of San Juan Ridge Mutual Water Users Association.

Inspections of projects in Calaveras and Mono counties were made during August, preliminary to the issuance of licenses.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Level work was carried on during August in connection with the Kreyenhagen Hills and Mt. Boardman quadrangles in Fresno, Stanislaus and Santa Clara counties. Field work was resumed on the Paynes Creek quarangle in Tehama County and the Burney Creek quadrangle in Shasta County. Some office work was done on the Healdsburg quadrangle in Sonoma County. Final sheets of El Toro, Coyote Hills, Orange and Garden Grove quadrangles in Orange County are now available. These are published on a scale of 1:31,680 with 5 nad 25 feet contour intervals. These are Federal-State cooperative sheets.

Final sheets of the Wilsona, Whitaker Peak and Hi Vista quadrangles situated in Los Angeles County are now available. These sheets are published on a scale of 1:24,000 with contour intervals of 5 and 25 feet. The work was done by the Topographic Branch of the U. S. Geological Survey in cooperation with Los Angeles County.

WATER RESOURCES

South Coastal Basin Investigation.

Work on the South Coastal Basin investigation has continued along routine lines.

Susan River (Lassen County)—Water distribution under the tentative schedule of allotments adopted by the water users for the 1935 season was continued throughout the month.

Water master service in the following districts was continued throughout the month: Hat Creek, Burney Creek and Cow Creek (Shasta County); Owl, Soldier, Emerson, Cedar, Deep and Mill Creek (in Surprise Valley, Modoc County); New Pine, Davis and Franklin Creek (in Goose Lake Valley, Modoc County); South Fork Pit River, Pine Creek, Hot Springs Valley, and Big Valley (Modoc and Lassen counties); Shasta River (Siskiyou County).

Automobile registration number plates of California in 1936 will be orange with black numerals and letters.

Finishing Warped Surfaces of Asphalt Concrete Pavement at Intersections

By **C. S. POPE,** Construction Engineer

IN LINE with a suggestion to district engineers, that they give brief descriptions of particular methods or features of road construction, the following is based on notes recently presented by District Construction Engineer R. S. Badger.

Contract 66TC3, road VI-Fre-4-Fre, provided for asphalt concrete pavement on 0.46 mile of Broadway in Fresno, between Tulare Street and Stantislaus Street. The width of pavement was increased by 10 feet to a total of 62 feet, and included new curbs and gutters and drainage improvements. F. W. Howard was the resident engineer in charge of contract.

HAND AND MACHINE COMBINATION

The outstanding feature of this work was the method by which warped surfaces of paving which occurred at intersections were worked out by a combination of a standard finishing machine supplemented by the use of hand equipment.

All the asphalt concrete on this project, except the base course and that portion laid at street intersections, was spread with spreader boxes and finished with a 30-foot mechanical finisher. The base course and street intersections were hand-raked.

Before paving was started, grades were painted on the pavement at 25-foot intervals indicating the distance from existing pavement to the new grade. The 3-foot 8-inch header was placed on its side and brought to a true grade with shims placed at 2-foot intervals, the inner edge of the header being 30 feet from the west gutter.

BRINGING TO GRADE

Holes were drilled at intervals of 4 feet into the existing pavement at the outer edge of the plank and stakes driven into them. After the planks were brought to grade, they were securely nailed to the stakes. Planks, 3 by 8 inch, were also laid flat along the gutter to carry one side of the finishing machine, and prevent damage to the concrete gutter.

The screeds of the finishing machine were divided into three 10-foot lengths and were set to approximately fit the typical section. At the third point from the gutter there was a noticeable angle in the pavement before rolling. To eliminate this, a three-wheel roller was passed over it twice before breaking down the asphalt concrete at the gutter, the cross-section of the completed pavement at this point having the appearance of a smooth curve.

SCREEDS NOT CHANGED

At street intersections, the finishing machine was used to spread the asphalt concrete but the screeds were not changed to fit the changing cross-section at these places. All the intersections were warped surfaces and no two were alike, therefore it was considered impractical to change the screeds. After the finishing machine had passed over each intersection, the asphalt concrete was brought to its proper shape with a 14-foot pole push float.

On account of its weight two men were required to operate the float. Two shovelers fed material in front of the cutting edge, keeping an even roll of the mix in front of the float, similar to a standard finishing machine screed.

For this type "B" asphalt surface the float secured excellent results, not only over the entire intersections, but at car track crossings and at junctions, when the day's work began.

SPOTTED WHILE HOT

After rolling the surface course sufficiently to produce a moderately smooth surface, and while the pavement was still quite hot, the smoothness of the pavement was checked with a 16-foot straight-edge. Low spots were filled and high spots were rolled down as rapidly as they were found, and by thus spotting while the pavement was still hot, it was possible to eliminate a patchy appearance. After spotting and at the proper time, the pavement was cross-rolled and bump-rolled in the usual manner.

TRUCK TAX RETURNS SHOW INCREASE OF 14 PER CENT

The tax on the gross receipts from the operation of motor trucks for the first six months of this year amounted to $556,505. This was 14 per cent higher than for the same period last year. This tax is assessed on the basis of 3 per cent of the gross and that return would indicate these carriers did a business in excess of $18,500,000 during the period. It is only those who operate trucks as a business outside of the limits of municipalities, who pay the tax.

MECHANICAL FINISHER, 30 foot wide, in operation on highway through Fresno.

HAND FINISHING warped intersection pavement at Fresno street with 14-foot pole push float.

COMPLETED JOB of asphalt concrete pavement at intersection of Fresno street and Broadway.

900 Feet Clear Road Ahead Needed to Pass Car Going 40 m.p.h.

THE DISTANCE required for one car to overtake and pass another has an important bearing on highway design and safety. Several hundred measurements of this distance are reported by H. C. Dickinson, chief of the division of heat and power, National Bureau of Standards, in *Highway Research Abstracts.*

The typical case of risk seems to involve one driver following another at a presumably safe distance and awaiting a clear space ahead long enough to permit overtaking safely the slower vehicle or line of vehicles. Under these conditions the maneuver of overtaking and passing consists of accelerating the rear car until it overtakes and clears the car ahead, and then returning to the right-hand traffic lane.

SIX SECONDS TO PASS

In all the test maneuvers the rear car, traveling at the same speed as the car ahead, started to accelerate from a position about one and one-half seconds in time behind the car ahead.

The results of several hundred measurements indicate that the time required to overtake and pass another car on a substantially level road, starting from a safe distance to the rear, is nearly six seconds and is independent of the speed.

Reduced to distances, for a car to overtake and pass another traveling at 40 m.p.h. on a road where speeds of 50 m.p.h. may be expected, the driver intending to overtake must have at least 900 feet of clear road ahead if the maneuver is to be performed with safety.

ALLOW SIX HUNDRED FIFTY FEET

In overtaking a more slowly moving vehicle —say a truck traveling at 20 m. p. h.—the safe distance is 650 feet, made up of 600 feet for the overtaking vehicle plus 50 feet for a vehicle approaching at 50 m. p. h.

For maximum speeds above 50 m. p. h., the safe distance is greater than 900 feet.

These figures bring out the importance of providing clear vision of the road for as long a distance ahead as is possible.

Pneumatic-tired trailers are popular vehicles in California, 77,982 such carriers having been registered in seven months of 1935.

THE WHITE LINE IN THE MIDDLE OF THE ROAD IN CALIFORNIA

In California, yes California, no other state that I know of, has as many miles of the white line in the middle of the road, as our dear old California.

The white line is, and should be, our guide, by day and night, over mountains and valleys, as we travel to and fro. I have traveled many, many miles, and I never feel safe unless I am on the right side of the white line in the middle of the road I am traveling.

What a wonderful idea it was, to the one who put his thought of the white line in the middle of the road for our guide.

O! how much sorrow and grief it has already saved our loved ones, and it will still go on, if we all observe and obey "The white line in the middle of the road."

I hope and pray that all states in our dear old U. S. A. will soon pass a law that all highways wherever they are, will have to have a white line in the middle of the road like the white line in the middle of the road in our dear old California.

—*Mrs. H. C. Webster*
Los Angeles

319,666 TRUCKS AND TRAILERS NOW USING CALIFORNIA HIGHWAYS

THE fact that the percentage of trucks and trailers increased more rapidly upon our highways than the percentage of pleasure cars during the latter depression years was established by the recent extensive traffic survey of the Division of Highways.

Referring to the importance of this great and growing industry to California and the effect upon it of the transfer of jurisdiction to the State Railroad Commission by recent act of the legislature, the magazine *Western Truck Owner* says:

"It is a tremendous task and one on which depends not only the welfare of the truck operators but to a great extent the prosperity of all industry throughout the State.

"Without the motor truck the major industries of the State could not operate. Our multi-billion-dollar oil industry would be obliged to practically cease, our fruit and vegetable crops—representing more dollars to the acre than any other part of the world—could not be moved to markets.

"California, to a greater extent than any other state or country in the world, is vitally dependent upon the modern, efficient transportation afforded by its 237,556 motor trucks and 82,110 trailers.

FIVE BIG BELLS that will ring out across the bay in fog and storm to warn skippers of the location of the Bay Bridge channel piers.

Bay Bridge Bells Will Warn Mariners

(Continued from page 8)

will be installed on the bridge piers in the ship channels of the bay to ring out warnings to navigation during foggy weather. They were cast in a South San Francisco foundry and will soon be hung in place on the pier structures.

Two of these bells weigh 3000 pounds each, have a diameter at the mouth of 52 inches, and stand approximately 40 inches high. The three smaller ones weigh 1600 pounds each, have a diameter of 40 inches and are about 30 inches high. The bells are of cast bronze and their sonorous tones will carry across a mile of water.

On dark, stormy nights and during heavy fogs their clanging chorus should be a novelty to transbay commuters. They will guide ships using the bay channels beneath the bridge.

TWO BELLS ON ANCHORAGE

The two large bells will be placed at the east and west sides of the great Center Anchorage and the three smaller ones will be installed at Piers E-4, E-5 and E-6 of the East Bay Crossing.

It has been ascertained by members of the staff of Chief Engineer C. H. Purcell, that the largest ship afloat, the French liner Normandie, can pass under the bridge with ample clearance.

The Normandie's forward mast is 193 feet above water-line. The side spans adjacent to the Center Anchorage of the bridge in the West Bay have a maximum clearance above low water of 216 feet for a distance of 1160 feet at either side of the Anchorage.

Snow Fighting Forces All Ready for Battle

Proud of its record last year in keeping highways open during storms that brought exceptional snowfalls, the Maintenance Department of the State Division of Highways is fully prepared to combat winter conditions in the high Sierras and other mountainous regions of the State according to Maintenance Engineer T. H. Dennis.

Exceeding in intensity and area any storm experienced since the department inaugurated the policy of keeping open all important roads, a storm starting last January 7 and continuing to January 20 tested the Highway forces to the limit.

During that storm the Maintenance Department kept 293 pieces of equipment ranging from "V" push plow motor graders to large auger-blower type rotaries at work continuously on 4500 miles of mountain roads.

U. S. Route 40, from Colfax over Donner Summit to the Nevada State Line, was the most difficult route in California to keep open, largely on account of drifting snow. On this section, ten 4-wheel-drive trucks with push-plow attachment, three auger-blower and one railroad type rotary plow were used.

All this equipment has been overhauled and repaired during the summer and the Maintenance Department is prepared for any onslaught of "King Snow" this winter.

Long stretches of snow fence have been installed at points on routes where drifting last winter was extremely serious.

Additional quarters for snow plow crews have been built at Emigrant Gap and Donner Summit by the Division of Highways. Last winter with large crews working day and night accommodations were not sufficient.

Highways Carry Over 87% of Passenger Mile Transportation

Professor S. S. Steinberg, head of the Department of Civil Engineering, University of Maryland, and president of the Educational Division, American Road Builders' Association, said in a recent address:

"Of the many developments of the twentieth century that of highway transportation has been the most profound and far reaching in its contributions to our national life. Our highway transportation system has not only added immeasurably to the national wealth but it has enriched the lives of our people socially and culturally.

VAST INDUSTRIAL STRUCTURE

"It has provided the foundation upon which has been erected a vast and diversified industrial structure that provides employment for both labor and capital in the manufacture, distribution and servicing of motor vehicles, in road-building and maintenance equipment, in the production and distribution of gasoline, oil and accessories, and in a variety of auxiliary services, including insurance, garages, parking facilities, roadside stands, hotels and many others.

"With more than 25,000,000 motor vehicles on our highways, sufficient in number to transport our entire population at one time, the business of highway transportation becomes one of the largest in the country.

EIGHT BILLION EXPENDITURE

"This is well borne out by some recent statistics. During 1934 the expenditure for new cars and trucks, for gasoline, oil and repair service, and for highway taxes totalled $8,000,000,000.

"Considering total passenger miles of transportation last year, and excluding waterways, we find that highways carried more than 87 per cent, steam and electric railroads more than 12 per cent and airplanes less than one per cent. There are more than 100,000 buses operating on our highways and they carry annually 2,000,000 passengers, which is equal to one bus ride for every person in the world."

There are 35,087,698 motor vehicles in the world, according to a compilation for 1934. Of this number, 71 per cent or 24,933,403 are in the United States.

PUZZLE PHOTO—Guess the size of this timepiece that gave photographer the jitters.

Paul Bunyan's Watch Appears on Highway

The above picture suggesting that Paul Bunyan must have passed that way and dropped his watch, approximately the size of a wash tub, in the middle of the road is the result of a freak double exposure on one negative.

The picture was taken by Assistant Office Engineer C. E. Waite of the Division of Highways, on Route 144 between Route 58 near Tehachapi and the Women's Prison. The work he was inspecting consisted of resurfacing with a road mix of natural soil and fuel oil, and Mr. Waite placed the watch on the road to give a comparison of the size and texture of the oil mixed material.

The first exposure of the negative was taken looking straight down at the road from a height of six or eight feet. Neglecting to turn the film to the next exposure a picture was taken looking down the road a considerable distance with the astonishing result of showing a small watch assuming the proportions of clocks which are seen on large city buildings. The watch actually measured one inch and three-quarters across the face.

Annual Meeting of Research Board

The Fifteenth Annual Meeting of the Highway Research Board of the National Research Council will be held in Washington, D. C., on December 5 and 6, 1935.

Highway Bids and Awards

for September, 1935

BUTTE, YOLO, COLUSA and EL DORADO COUNTIES—Between Chico and Tehama County line, But. 3D, between Davis Wye and Woodland; Yol. 7A, between Maxwell and Delevan; Col. 7C, between Placerville and R. R. Crossing; E. D. 11D, between Riverton and Kyburz; E. D. 11G, between 2.5 miles east of Lake-Col. Co. line and about 5.5 miles east Col. 15D, about 27.1 miles to be treated with Class "A," "B" and "C" Seal coats. District III, Routes 3, 7, 15, 7, 11, Sections D, A, C, D, G. Lee J. Immel, Berkeley, $14,548; A. Teichert & Son, Inc., Sacramento, $16,756. Contract awarded to Hayward Building Materials Co., Hayward, $13,870.45.

INYO COUNTY—In Inyo County, between Panamint Sink and County Line, about 54 miles in length to be road mix surface treated. District IX, Route 127, Sections G, M, N, P. Oilfields Trucking Company, Bakersfield, $72,040; Basich Brothers, Torrance, $66,525; J. C. Compton, McMinnville, Ore., $64,355. Contract awarded to C. W. Wood, Stockton, $62,200.

INYO COUNTY—Road oil approximately 17.8 miles between easterly boundary of Death Valley Monument and 0.5 mile south of Death Valley Junction. District IX, Route 127, Sections L, M. Morgan Bros., Huntington Park, $5,775; Oilfields Trucking Co., Bakersfield, $6,037; Gilmore Oil Co., Los Angeles, $6,370. Contract awarded to Paulsen and March, Inc., Los Angeles, $5,565.

KERN COUNTY—Between 2 miles southwest of Searles and Rademacher. About 5 miles to be graded. District IX, Route 145, Section A, B. John Jurkovich, Fresno, $13,141. Contract awarded to Basich Bros., Torrance, $6,950.

KERN COUNTY—Between Johannesburg and Route 23, about 30.5 miles, road-mix surface treatment to be applied. District IX, Route 145, Sections A, B, C. J. C. Compton, McMinnville, Ore., $26,599; Basich Bros., Torrance, $29,918; John Juckovich, Fresno, $30,220; Oilfields Trucking Co., & Stewart & Nuss, Inc., Bakersfield, $30,303; Clyde W. Wood, Stockton, $30,615; Martin Bros. Trucking Co., Long Beach, $34,551. Contract awarded to A. S. Vinnell Co., Los Angeles, $26,010.50.

LOS ANGELES COUNTY—A portion of a timber bridge across Los Angeles River at Olive St., near Compton, consisting of eight 38-foot truss spans and approximately 90 feet of trestle to be reconstructed. District VII, Route 167, Section A. Robert D. Patterson, Santa Barbara, $16,332; Parish Bros., Los Angeles, $16,282; Lynch-Cannon Eng. Co., Los Angeles, $16,510; D. A. Loomis, Glendale, $15,172; R. R. Bishop, Long Beach, $17,145; W. H. McCune, Monrovia, $15,993; E. G. Perham. Los Angeles, $15,555. Contract awarded to Oscar Oberg, Los Angeles, $14,942.60.

MARIN COUNTY—Between Greenbrae and Alto, about 0.4 mile. Slides to be removed. District IV, Route 1, Section C. N. M. Ball Sons, Berkeley, $15,750; Bay Shore Const. Co., Inc., San Francisco, $16,000; A. G. Raisch, San Francisco, $16,875; Biasotti, Willard & Biasotti, Stockton, $17,125; Granfield, Farrar & Carlin, San Francisco, $17,250; James L. Conner, Monterey, $20,375. Contract awarded to Healy Tibbitts Const. Co., San Francisco, $15,000.

NEVADA, PLACER and BUTTE COUNTIES—Between Nevada City and Washington Road, between Nevada, Placer County line east of Cisco and Soda Springs; between Oroville and Junction Routes 3 and 87 south of Chico, about 18.8 miles Class "A" and "B," Seal coats. District III, Routes 15, 37, 87, Sections C-F, B-B. Lee J. Immel, Berkeley, $14,040; A. Teichert & Son, Inc., Sacramento, $15,195. Contract awarded to Hayward Building Materials Co., Hayward, $13,263.50.

SACRAMENTO, PLACER, YUBA, SUTTER, BUTTE, YOLO, COLUSA, GLENN, EL DORADO and NEVADA COUNTIES—Traffic stripe painting and spotting. District III. Various routes and sections. Raymond P. Paoli, San Francisco, $2,611. Contract awarded to Edwin Anderson, San Francisco, $2,509.50.

SAN BERNARDINO COUNTY—Big Pines Road, about six (6) miles in length to be treated with liquid asphalt. District VIII, Route 61, Section A. Paulsen & March, Inc., Los Angeles, $1,406; Gilmore Oil Co., Los Angeles, $1,403. Contract awarded to Morgan Bros., Huntington Park, $1,203.50.

SAN BERNARDINO COUNTY—Between north boundary and Baker, 42.6 miles to be seal coated. Dist. VIII, Rt. 127, Secs. A, B, C, D. Geo. French, Jr., Stockton, $72,345; C. W. Wood, Stockton, $72,807; Geo. Herz & Co., San Bernardino, $76,920; J. C. Compton, McMinnville, Ore., $75,400; Oilfields Trucking Co. & Stewart & Nuss, Bakersfield, $81,931; Oswald Bros., Los Angeles, $89,572. Contract awarded to Basich Bros., Torrance, $71,074.50.

SAN BERNARDINO and KERN COUNTIES—Between Johannesburg and Route 58, about 27.4 miles in length, road-mix surface treatment and seal coat to be applied. District VIII, Route 145, Sections D, E, A. Geo. Herz & Co., San Bernardino, $42,882; A. S. Vinnell Co., Los Angeles, $43,203; C. W. Wood, Stockton, $43,272; Matich Bros., Elsinore, $43,690; J. A. Casson, Hayward, $44,864; Oil Fields Trucking Co., & Steward & Nuss, Inc., Bakersfield and Fresno, $46,033; J. C. Compton, McMinnville, Ore., $46,528; Oswald Bros., Los Angeles, $49,245; C. F. Frederickson & Sons, Lower Lake, $54,700. Contract awarded to Basich Bros., Torrance, $39,581.75.

SAN DIEGO COUNTY—Various locations between 4 miles east of Bostonia and 2 miles east of Alpine about 2.4 miles. Place plant mix surf. const. shldrs. and apply road mix. surf. trmt. District XI, Route 12, Sections C and D. Daley Corp., San Diego, $25,311; V. R. Dennis Const. Co., San Diego, $25,035. Contract awarded to R. E. Hazard & Sons, San Diego, $24,384.25.

SAN JOAQUIN COUNTY—At Fresno Ave., grade separation, City of Stockton, 200 feet of A. C. Paving & P. C. C. Curbs. District X, Route Feeder. Lord & Bishop, Sacramento, $2,504. Contract awarded to Heafey Moore Co., Oakland, $2,050.05.

SAN LUIS OBISPO COUNTY—In San Luis Obispo Co., between Estrella River and easterly boundary, about 21.2 miles in length. Seal coat to be applied. District V, Route 33, Sections B, C. L. A. Brisco, Arroyo Grande, $16,187; Walter B. Roselip, San Luis Obispo, $16,610. Contract awarded to E. L. Yeager, San Bernardino, $15,416.80.

SHASTA and LASSEN COUNTIES—Between Fall River Mills and Nubeiber, about 19.7 miles, a light armor coat to be applied. District II, Route 28, Sections E, A. Contract awarded to Dunn & Baker, Klamath Falls, Ore., $43,211.

SONOMA COUNTY—Furnishing and applying seal coating between Cloverdale and north boundary, 3.2 miles. Dist. IV, Rt. 1, Sec. D. Lee J. Immel, Berkeley, $3,300; E. A. Forde, San Anselmo, $3,232. Contract awarded to Palo Alto Road Materials Co., Palo Alto, $3,112.50.

SONOMA COUNTY—Between easterly boundary and 9 miles westerly, seal coat to be applied about 9 miles. District IV, Route 8, Sections A, B. Lee J. Immel, Berkeley, $5,735; Ransome Co., Emeryville, $5,605; Palo Alto Road Materials Co., Ltd., Palo Alto, $5,837; Helwig Construction Co., Sebastopol, $6,827; A. Teichert & Son, Inc., Sacramento, $6,865. Contract awarded to E. A. Forde, San Anselmo, $5,485.

SONOMA COUNTY—Reinforced concrete girder bridge across Sonoma Creek, about 7 miles north of Sonoma; consists of three 52-foot spans on concrete piers and abutments. District IV, Section Son. Sonoma State Home. Albert H. Seimer, Frank J. Main, San Anselmo, $16,310; N. M. Ball Sons, Berkeley, $13,961; Renati Bros., Novato, $14,728; M. B. McGowan, Inc., San Francisco, $16,810; F. C. Armoroso & Sons, San Francisco, $15,640; Lindgren & Swinerton, Inc., San Francisco, $18,191; A. G. Raisch, San Francisco, $18,872; E. S. and N. S. Johnson, Pasadena, $13,890; Harry J. Oser, San Francisco, $16,691; A. T. Howe, Santa Rosa, $14,375; McHugh and Heilman, San Francisco, $15,516. Contract awarded to John Carcano, San Rafael, $13,777.

TEHAMA COUNTY—Between Route 3 and 1½ miles east of Dales, 13.4 miles seal coating. Dist. II, Rt. 29, Sec. A. Hemstreet & Bell, Marysville, $5,827; Tiffany Const. Co., San Jose, $6,985. Contract awarded to A. Teichert & Son, Sacramento, $5,708.25.

Many State Highway Improvements Noted in Southern Counties

MOTORING has been made easier and safer through many recent improvements on State highways in Southern California, says the Automobile Club of Southern California, which itemizes the following:

Completion of the 11.3-mile State Street project between Redondo Beach and Long Beach to form a final link in a continuous, modern highway along the Southland coast.

Completion of nearly two miles of widening and reconstruction work on the State highway in Laguna Beach between Cypress Street and the south city limits, last unimproved section of the coast route from Long Beach to its junction with the original State route to San Diego at Doheny Park.

DANGEROUS SLIDE ELIMINATED

Elimination of the steep and dangerous five-mile stretch of road passing Sulphur Slide in Santa Ana Canyon, Orange County, by construction of a 3.44-mile cut-off recently opened, extending from four-tenths of a mile east of Peralta School to Gypsum Creek.

Elimination of dangerous "Dead Man's Curve," scene of many accidents on the narrow old Ridge Route, through relocation and improvement of 5.2 miles of the highway between Fort Tejon and Grapevine Station. Five miles more of the Grapevine Canyon section of the improvement remain to be built extending between Fort Tejon and the Los Angeles County line.

Blasting of 25,000 cubic yards of ledge rock into Partington Canyon at a point 38 miles south of Carmel on the new scenic Carmel-San Simeon link of the Roosevelt Highway now under construction, which will form a rockfill roadway embankment.

Increase in number of automobile drivers in California apparently is on a par with the five-year record gain in automobile registration, Ray Ingels, Director of Department of Motor Vehicles, has informed Governor Frank F. Merriam. Recent figures showed more than 2,000,000 paid automobile registrations.

At the present time there are 9,251,000 miles of highways in the world, it is reported, with an average of 3.8 automobiles to each mile of road.

2,000,000 MILES OF HIGHWAYS IN U. S. STILL IN "MUD" CLASS

Figures obtained from the most reliable sources show that 42 per cent of the American farms are located on mud roads—the name applied to unimproved roads.

Of the total 3,040,000 miles of highways in the United States, only 920,000 miles have been improved, and of this only 160,000 miles have been improved with high type surfacing.

Thus, we see that more than 2,000,000 miles of highways remain untouched so far as systematic improvement goes, and a large part of this mileage receives no attention other than make-shift, community work—the kind of hand-shovel and hand-scrape work that was being done by the Pilgrim settlers in Massachusetts 300 years ago.

The drivers of 60,000 school buses that carry 2,000,000 pupils to rural schools, fully realize the need of road improvement. Farmers and others who use these roads also know the urgent necessity of "getting out of the mud."—*American Road Builder.*

Old Timers' Honor Passes to M. E. Tozer

When the first seven division engineers of the first California Highway Commission reported for duty on January 2, 1912, and began hiring employees they gave each man appointed a card certifying to his appointment and stating his rank in the service.

In the July issue of this magazine was published a facsimile of the employment card given by the Highway Commission on August 26, 1912, to E. M. Cameron, then a transitman and now District 1 Construction Engineer, and the editor asked if any old timer in the service had a card that antedated the one possessed by Mr. Cameron.

The question was answered by M. E. Tozer, 702 West 8th Street, Santa Ana, assistant bridge construction engineer of the Division of Highways in District No. 7.

Mr. Tozer read about Mr. Cameron's card, looked through a collection of old keepsakes and found the employment card issued to him as a draftsman in Division 5 by the Highway Commission on June 24, 1912.

"My card," writes Mr. Tozer, answering the editor's query, "predates Mr. Cameron's by two months."

Registration number plate contract for 1936 indicates California expects to tag more than 1,980,000 pleasure motor vehicles in the coming year.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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R. H. STALNAKER, Equipment Engineer
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A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
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MAP
SHOWING
STATE HIGHWAY SYSTEM

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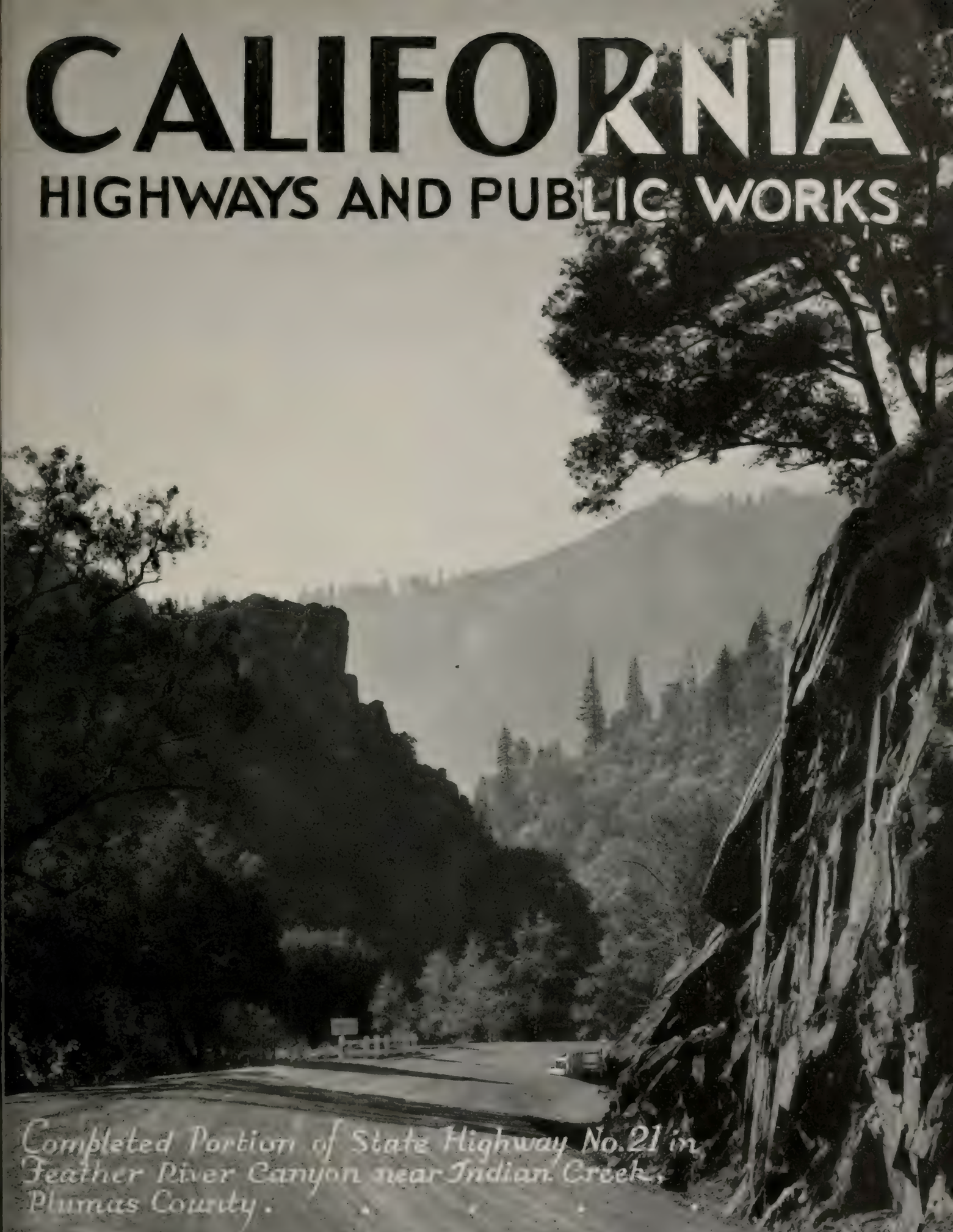

Completed Portion of State Highway No. 21 in Feather River Canyon near Indian Creek, Plumas County.

Official Journal of the Department of Public Works
NOVEMBER · 1935

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Fifty Highway Projects

Providing 4,500,000 Man-hours Work

Being Put Under Way

With Federal Relief Funds

By **HARRY A. HOPKINS,** Chairman California Highway Commission

A PROGRAM of 50 Federal Works Highway projects has been recommended by the Division of Highways for construction under the allocation as authorized by Congress of Federal Emergency Relief funds to California and has been approved up to this date by the three federal agencies that are administering these funds.

The projects as approved by the District Office of the U. S. Bureau of Public Roads; the State Director of the National Emergency Council and the State Administrator of the National Works Progress Administration provide for expenditure of 78 per cent of the federal funds allocated for distribution and administration by the State Division of Highways for the improvement of state highways, feeder roads, and streets in cities or metropolitan areas under the Emergency Apportionment Act of 1935.

HARRY A. HOPKINS

The highway improvements thus made possible in California are in addition to the projects provided for in the regular state highway budget and in the Federal Grade Separation program recently published.

The Federal regulations governing the expenditure of the funds require that at least 25 per cent shall be applied to county or feeder roads not on the Federal Aid or state highway systems and at least 25 per cent to city streets or roads in metropolitan areas. The balance is to be applied on state highways or Federal Aid routes.

The 50 approved projects include 32 on state highways in 25 counties; 11 on feeder roads in 10 counties; and 7 in cities or metropolitan areas in 2 counties, thus distributing the improvements over 37 counties.

The program submitted provides for an expenditure of approximately 78 per cent of the total apportionment, of which 40 per cent is on feeder roads and metropolitan area projects and the balance, or about 38 per cent, on the state highway system.

The remaining balance of the total apportionment has been recommended on definite projects in metropolitan areas but some adjustment of these projects is necessary to obtain final Federal approval.

RELIEF TO UNEMPLOYMENT

The projects included in this program will provide approximately 4,300,000 man hours

(Continued on page 8)

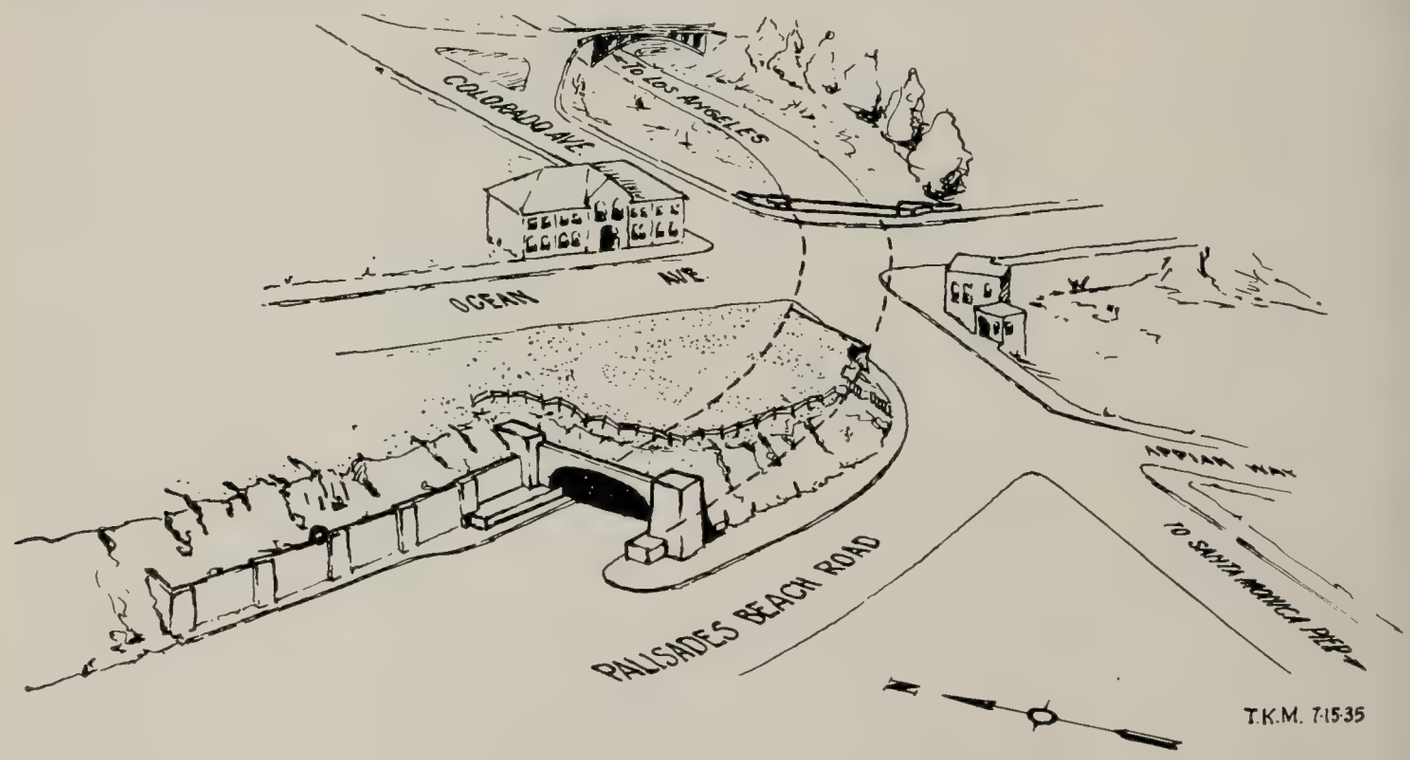
NOV 22 1935

Santa Monica Tunnel Being Built in Open Cut on Footing of Concrete Piles

By **P. R. WATSON,** Resident Engineer

ANOTHER highly important project in the improvement of highway facilities for the movement of traffic to and from the Los Angeles metropolitan area through the Santa Monica coastal district is the Santa Monica Tunnel now fast approaching completion.

The contract was 80 per cent complete on November 4th, 6 per cent ahead of schedule. On that date, the east portal with its massive pylons, one pylon of the west portal, the 170 foot retaining wall at the westerly end and nine of the ten forty-foot sections of the tunnel had been constructed.



SKETCH showing route of Santa Monica Tunnel from Beach road under park and city avenues.

The Santa Monica Tunnel forms the connecting link between the Roosevelt Highway and Lincoln Boulevard in the city of Santa Monica, both highways being a part of U. S. Highway 101.

BUILT IN OPEN CUT

It passes under the intersection of Ocean and Colorado Avenues in the city and under a portion of the Palisades Park. The 400-foot tunnel was made necessary by restrictions which prevent use of the park for highway purposes so that it was decided to go under instead of through it. As the tunnel plans bring the top but a very short distance below the original ground surface, open cut construction was used and upon completion of the work the tunnel will be covered with back fill to conform to the original surface of the park.

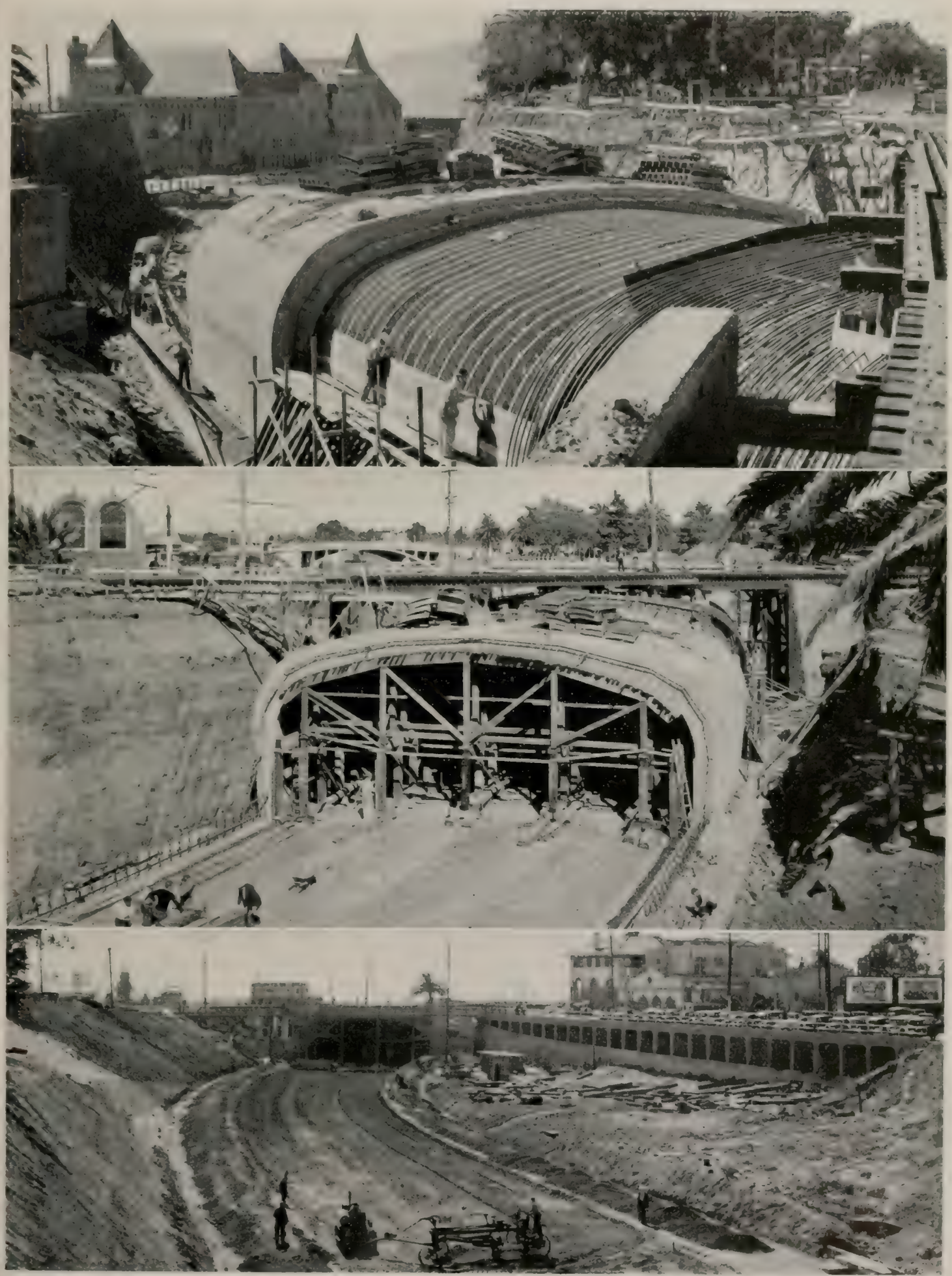
The tunnel excavation was started at the west portal to allow the Pacific Electric Co. to construct a temporary trestle across Colorado Street for their tracks and to allow removal of the existing tracks from Ocean Avenue where the tracks interfered with construction. Various other public utilities took advantage of this delay to get their lines clear of the work.

Some difficulty was encountered by the contractor due to the instability of the soil and it was necessary to slope banks well back to protect the work. In all, 43,000 cubic yards of earth were removed.

PILE-DRIVER CAUSES SLIDE

The driving of the foundation piles followed closely the grading operation. A sub-

(Continued on page 28)



SANTA MONICA TUNNEL CONSTRUCTION—At top, view of open cut through Palisades park, looking toward beach, showing one section of tunnel already concreted and preparation of falsework and reinforcement materials for next section. The center picture gives a good view of the flat arch type made necessary by location conditions. At bottom is shown the east approach open cut under construction.

Sepulveda Boulevard Key Link Opened and Dedicated by Governor Merriam

By **P. A. McDONALD,** Assistant Office Engineer

"THE Sepulveda Boulevard route" and "an outlet to the sea," phrases that have long been synonymous for the residents of the great San Fernando Valley, became a reality on Sunday, October 20, 1935, when amid colorful and impressive ceremonies the new paved highway between Ventura Boulevard and Sunset Boulevard was officially opened and dedicated. This new highway is the key section of the Sepulveda Boulevard route linking the San Fernando Valley with the beach cities.

In attendance at the formal dedication ceremonies representing the State, were Governor Frank F. Merriam; Earl Lee Kelly, Director of Public Works; Justus F. Craemer, Assistant Director of Public Works; Ed. J. Neron, Deputy Director; Chairman Harry A. Hopkins, California Highway Commission; Julien D. Roussel, Secretary of California Highway Commission; S. V. Cortelyou, District Engineer, Division of Highways.

PROGRAM IN PATIO

Also in attendance were Supervisor John R. Quinn, Los Angeles County; Lloyd Aldrich, City Engineer of Los Angeles; as well as members of the City Council; members of the Los Angeles City Board of Public Works; and others prominent in political, social and religious activities.

In the patio before the Casa De Sepulveda situated in a cleft of the hills, a program was conducted with Leo Carillo, motion picture celebrity and member of one of the early California families, acting as master of ceremonies. Governor Frank F. Merriam was introduced, the Harvard School R. O. T. C. unit, acting as Guard of Honor. Brief remarks were made by various state, county and city officials.

Governor Merriam pledged himself to a continuance of the policy of devoting all gas tax moneys to the construction and improvement of more highways; Director of Public Works Earl Lee Kelly said that $850,000 would be spent in the next year and a half for further improvements of the Sepulveda Boulevard route; and Chairman Harry A. Hopkins of the California Highway Commission told of the progress made in the development of such through routes.

SEPULVEDA SCIONS PRESENT

Following this a pageant of dances and songs was held depicting the various stages in the development of California from the early days of the Spanish period. It was only fitting that assisting in dedication of this new highway, traversing lands once owned by Don Francisco Sepulveda, and known as Rancho San Vicente, there should be present a great-granddaughter of the old Don, the Princess Conchita Sepulveda de Pignatelli, with her little daughter, Stefanella Pignatelli, who cut the traditional ribbon opening the highway in formal dedication.

Other pioneer descendants present were Senora Dolores Machada y Sepulveda, Mrs. Josephin Sepulveda Bacon, and Mrs. Louisa Sepulveda, granddaughters; Senor Ildephonso A. Sepulveda and John G. Mott, great-grandsons of Don Francisco.

These were the ones who saw more behind the fiesta celebration than a direct and smooth highway which will make traffic between the coast and the valley faster and more economical. Their memories recalled, no doubt, the early history of this area, of which their immediate forebears were a part.

GLAMOROUS DAYS RECALLED

They recalled the Portola Monterey Expedition in 1769, when the old Sepulveda trail was first mentioned by Fray Juan Crespi, diarist of the expedition; how the path was later used to transport goods from San Fernando Mission to San Pedro, and how the grantees of the great ranchos, retired from the king's service, rode across the trail to reach El Camino Real.

And as the glamorous days of the dons gave way to modern things and the Sepulveda descendants joined the modern march, the old trail grew important to commerce. In 1922, first steps were taken to transform the Indian footpath to a highway of commerce.

The dedication day program began with a great caravan of automobiles and historic floats carrying representatives from a score of

(Continued on page 18)

SEPULVEDA HIGHWAY DEDICATION SCENES—A portion of the three-lane key link of the new highway which was officially opened to the public by Governor Merriam Sunday, October 20, is shown in the top picture. This key link section pierces the Santa Monica mountains by tunnel and connects San Fernando Valley with the remainder of the route to the sea.

In the State official group, left to right, are Justus F. Craemer, Assistant Director of Public Works; F. J. Grumm, Engineer of Surveys and Plans; District Engineer S. V. Cortelyou; Director of Public Works Earl Lee Kelly; Governor Frank F. Merriam; Chairman Harry A. Hopkins of the California Highway Commission; Secretary Julien Roussel; Deputy Director of Public Works Ed. Neron and Ralph Balfour, District Right of Way Agent.

Bottom picture shows the west portal of the tunnel.

Seven Miles of Box Canyon Highway Graded, Surfaced, Opened in 42 Days

By **H. S. COMLY**, District Maintenance Engineer

FOLLOWING the deluge that descended upon the desert mountains north of the Salton Sea, in Riverside County, in the early morning of August 23d, the maintenance forces of District XI of the Division of Highways immediately started the work of repairing the damage which had been done to State Highway Route 64 through Box Canyon, about six miles north of Mecca. Seven miles of road had been completely obliterated so that the task included the location, grading and surfacing of an entirely new road.

Preliminary work started on the morning of August 23d, a few hours after the damage had been wrought, using what equipment and men were available at maintenance stations at Indio and Oasis. Additional equipment and men were started out from other points in the district and on the morning of August 26th operations were in full swing, clearing debris and following up with the grading.

GRADED WITH TRACTORS

As the road lies almost entirely in the bottom of the wash, only tracklaying type of equipment could be used, the sand being too unstable to afford traction to wheeled equipment. The entire seven miles of road was graded with tractors operating bulldozers, revolving scrapers and road graders.

Field location surveys were made immediately in advance of the grading forces, grades laid in the field and stakes set for construction. The road by this method, was built on much better alignment than the old road which followed the pioneer wagon road closely, traversing lines of least resistance. Advantage was taken of the experience gained during many years maintenance and the road located where it will be least affected by future floods.

OPENED IN 42 DAYS

On September 20th, when grading operations had advanced sufficiently to allow of unimpeded progress to oiling operations, surfacing was started. The surface was constructed to a width of 20 feet by mixing the natural sandy material with asphaltic oil at the rate of two gallons per square yard.

Grading and surfacing had advanced sufficiently on October 7th, to permit of opening the entire seven miles of road to light traffic, 42 days after the flood.

Through traffic had not been inconvenienced during this period as the Indio Cut-off leading direct to Indio over State Highway Route 64 was open for uninterrupted travel at all time.

The road was compacted sufficiently to permit of its opening to unrestricted traffic on October 17th and final trimming was done and the job completed on October 25th.

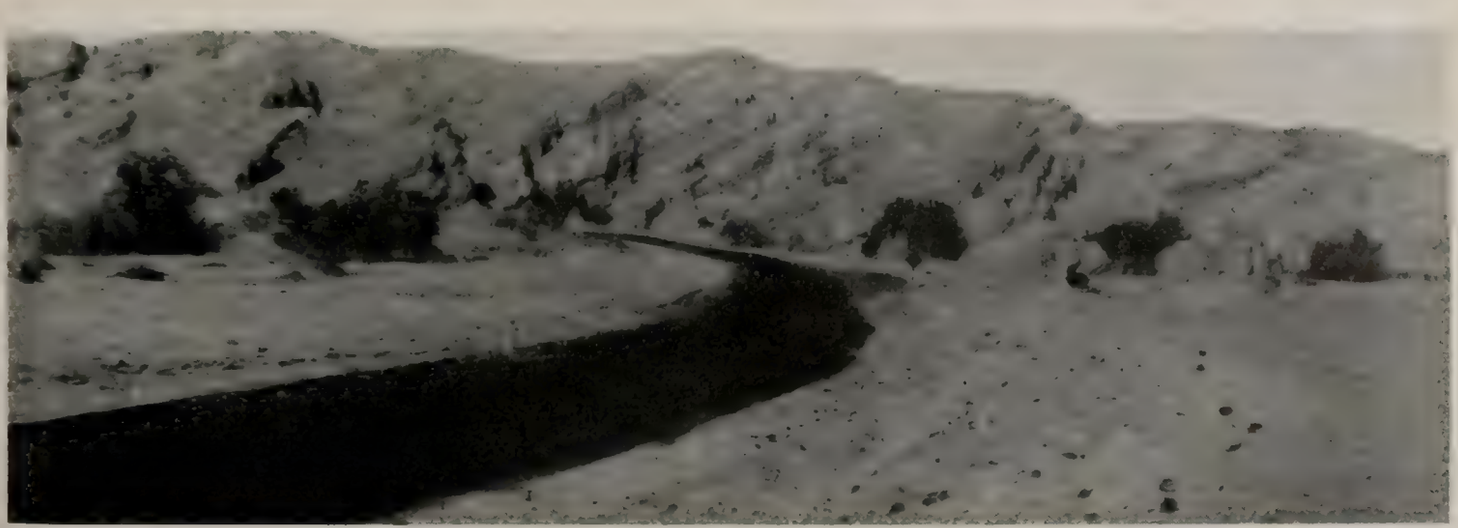
Five hundred tons of asphaltic oil were used in constructing the surface and the total cost of the seven miles of road, including grading was $12,000. All work on the project was done by the maintenance forces of the Division of Highways, under the direction of Superintendent Mitchell at Indio.

Phil. Stanton on Road Back to Good Health

This Thanksgiving Day will be a far pleasanter one for State Highway Commissioner Philip A. Stanton of Anaheim than was the last one.

Mr. Stanton was afflicted with a serious illness a year ago, partially recovered and then suffered a relapse. For many months he was confined to his bed. Now he is improving rapidly, is able to walk about his room and while still kept at home by his physicians is once more taking an active part in state highway affairs, receiving visitors and personally attending to official correspondence.

Until his illness, he rarely missed a meeting of the Highway Commission. His years in the State legislature and participation in public affairs have made him a well known figure in every section of California and thousands of his friends and acquaintances will be pleased to hear that he is on the road to recovery.



BEFORE AND AFTER THE FLOOD. The above pictures show two sections of the 7-mile stretch of highway in Box Canyon, Riverside County, that was entirely destroyed by a cloudburst storm on August 23d last and the restored highway as completely graded and surfaced on new location and better alignment and opened to traffic in 42 days.

Six Months Work for 5300 Men

(Continued from page 1)

of work, or translated into other terms: 5300 men will be employed for a full 6 months period. These are average figures both for men and for the time since all of these jobs will not run for exactly 6 months. Some will take longer time to complete and some less time. They indicate, however, the gainful employment which will be provided by this Federal allocation.

ties and cities will be required to supply the necessary funds for right of ways on feeder roads or projects in metropolitan areas not on the state highway system.

MINOR EXPENDITURES NECESSARY

These limitations on the application of the Federal funds mean that on all of these projects the state may be required to bear

FEDERAL EMERGENCY RELIEF PROJECTS ON STATE HIGHWAYS

County	Route	Location	Miles	Type	Amount
Mendocino	48-AB	The Oaks and Clow Cr. Line Changes	1.74	Grade and Surface	$50,000
Lassen	29-E	Long Valley to Jc. of Route 29	9.25	Grade and Oil	140,000
Tehama	3-AD	Southerly Boundary to Red Bluff	15.00	Grade and Widen	150,000
Shasta	28-A	1½ mi. E. of Bella Vista to Diddy Hill	7.7	Grade and Surface	210,000
Modoc	28-C	2½ mi. W. of Cedarville to State Line	12.5	Grade and Oil	75,000
Plumas	21-G	Near Summit School to Beckwith Pass	5.0	Grade and Oil	60,000
Butte	45-A	Big Butte Creek to Biggs Road (portions)	4.0	Oil and Surf. Seal Coat	16,700
Sacramento	11-DEF	Isleton to Sacramento (portions)	16.5	Grade and Surf. Shldrs.	150,000
Placer	91-A	Lincoln to Newcastle (portions)	2.0	Grade and Oil	30,000
Santa Cruz	116-A	San Lorenzo R. near Ben Lomond	0.43	Grade, Surf. and 2 Brs.	43,000
Sonoma	104-C	Cotati to 2 mi. West	2.19	Grade, Surf. and Struct.	75,500
San Joaquin	53-C	Potato Slough at Terminous	0.40	Bridge and Apprs.	150,000
Tuolumne	13-C	Sullivan Cr. to 3½ mi. NE.	3.38	Grade and Surf.	102,000
Stanislaus	110-A	1 mi. W. to 1.6 E. San Joaquin R.	2.6	Bridge and Apprs.	143,000
Monterey	56-F	Molera Ranch to 1.6 mi. Southerly	1.8	Grade and Surf.	90,000
San Luis Obispo	125-D	1 mi. E. Cholame to Kern Co. Line	6.7	Grade and Surf.	217,000
Santa Barbara	80-A	Santa Barbara Ave. to Los Olivos	5.3	Grade and Surf.	141,000
San Benito	119-C	Paicines to Pinnacles (portions)	2.4	Grade and Surf.	100,000
Kern	139-B	4 mi. S. of Shafter to Shafter	4.0	Grade and Surf.	75,000
Ventura	151-B	Casitas Pass—East Pass to West Pass	2.38	Grade and Surf.	84,000
Ventura	151-B	Casitas Pass—East Pass to Coyote Cr. Br.		Grade and Surf.	76,500
Orange	183-A	Bolsa Ave; Westminster Blvd. to Bolsa Chica Rd.	3.00	Surfacing	40,000
Ventura	9-AB	L. A. Ave.; La Vista to Somis Road	5.91	Grade and Pave	55,000
San Bernardino	59-E	Lake Arrowhead Dam to 3 mi. N.	2.5	Grade and Surf.	75,000
San Bernardino	61-A	Wrightwood to Rte. 59	5.9	Grade	150,000
San Bernardino	191-A	Little Mt. entrance to San Bernardino	1.0	Grade and Surf.	63,000
San Bernardino	77-A	Co. Line to Merrill Ave.	4.0	Grade and Surf.	66,000
Inyo	128-A	Death Valley Jct. to Nevada Line	7.2	Grade	10,000
Inyo	76-A	1¾ mi. N. Bishop to Mono Co. Line	7.3	Grade	15,500
Riverside	187-F	Mecca to Rte. 26 (portions)	8.5	Grade and Surf.	25,000
Riverside	64-Q	10 mi. W. Indio to Indio	10.3	Grade, Oil and Bridge	150,000
Imperial	201-AB	E. of Heber to E. of Brawley	17.2	Grade, Surf. and Br.	50,000

While this program is being financed almost in its entirety with Federal funds the state will have to provide for purchase of rights of way and certain incidental minor improvements as the Federal funds are not available for such purposes. The state will be obliged to use its own highway funds for necessary rights of way on projects on the state highway system. For the same reason the counpart of the cost, such as expenditures for the construction of cattle passes, culverts, fences, and rental of publicly owned equipment, which are continually cropping up on every job.

Like the Federal Grade Separation program, projects on this highway program must be under contract by December 15th to comply with the Federal government's regulations

Projects Already Advertised for Bids

(Continued from preceding page)

and the Department of Public Works is striving to accomplish this result. A considerable number of these projects have already been advertised for bids.

The limited time permitted has necessitated the working of three shifts of engineers, draftsmen, specification writers and others in the district offices of the Division of Highways, as well as the Sacramento headquarters and I am confident we will have the program ready by December 15th.

The recommended projects on the state highways, feeder roads and metropolitan area streets and roads are listed in the accompanying tabulations showing the location, mileage, and type of each project.

FEDERAL EMERGENCY RELIEF PROJECTS ON FEEDER ROADS

County	Route	Location	Miles	Type	Amount
Mendocino	Feeder	Longvale to Dos Rios	16.0	Grade	304,732
Napa	Feeder	E. Side Napa R. Road—St. Helena to Larkmead	6.27	Grade and Bridge	60,264
Calaveras	Feeder	Mokelumne R. to West Point	1.6	Grade and Bridge	161,439
Kings	Feeder	6 mi. N. Hanford to 2 mi. S. Kingsburg, Stratford to Lemoore	14.5	Widening Shldrs.	14,730
Fresno	Feeder	State Hiway near Dunlap to Orange Cove	13.0	Grading	31,000
Kern	Feeder	Kern Co. Park to 1 mi. East	1.0	Grade	38,300
Los Angeles-Orange	Feeder	State Rte. 176 at Cedar St. to Luitweiler Ave.	2.56	Grade and Surf.	327,000
Los Angeles	Feeder	San Gabriel Canyon; Camp Bonito to Follows Camp	2.5	Grade	372,600
Los Angeles	Feeder	Palo Verdes near Portuguese Bend		Grade and Oil	306,100
San Diego	Feeder	Iron Spgs. Cr. to Palomar Mt. Observatory	3.25	Grade and Surf.	301,962
Imperial	Feeder	2 mi. W. Calapatria to Imperial Road	20.0	Grade and Surf.	296,800

FEDERAL EMERGENCY RELIEF PROJECTS IN MUNICIPALITIES

County	Route	Location	Miles	Type	Amount
Los Angeles	Feeder	Glendale; Los Feliz Rd.; San Fernando Rd. to S. P. R. R.	0.15	Widen and Resurface	18,398
Los Angeles	161-Gndl	Glendale; Colorado St.; Central Ave. to San Fernando Rd.	0.64	Grade and Repave	38,031
Orange	Feeder	City of Orange; Batavia St., La Veta to Walnut	1.00	Grade and Pave	9,922
Orange	181-Ora	Glassell Ave.; Maple to Almond—Chapman Ave.; Plaza to Orange	0.30	A. C. Pavement	23,073
Los Angeles	Feeder	Somerset Ave.; Spring St. to Hathaway Drive	2.2	Grade and Oil	63,242
Orange	184-SA	S. Main St. in Santa Ana	1.27	Widen Roadway	48,183
Los Angeles	158	Sepulveda Blvd.; Brand Blvd. to San Fernando Rd.	3.79	Grade	510,600

NEW OIL RESERVES DISCOVERED

Recent warnings that the petroleum reserves of the United States are nearing exhaustion are to a degree discounted in a booklet just published by the American Petroleum Institute which states that new crude oil reserves discovered so far this year have been greater than estimated crude oil requirements for the entire year. The principal discoveries have been made in Texas, Oklahoma, New Mexico and Louisiana.

She: "Are you cool in time of danger?"
He: "Yes—but at the wrong end."

Guide—"This castle has stood for 600 years. Not a stone has been touched, nothing altered, nothing replaced."

Visitor—"Um, they must have the same landlord we have."—Chaser.

Conejo Grade Realignment to Save Mileage, Abolish Dangerous Curves

By **JUSTUS F. CRAEMER,** Assistant Director of Public Works

WITH an allocation of $550,000 set up in the current biennial budget for the "realignment and improvement of Conejo Grade" and bids for the contract scheduled for opening November 21, dirt will soon be flying on this major reconstruction project in Ventura County that will eliminate the old narrow and dangerous section of state highway on the "Ventura Boulevard" route between Los Angeles and Ventura that has long been a detriment and menace to traffic because of its steep grades and hairpin turns.

Originally located in 1912 as one of the first roads to be surveyed by the then newly organized State Highway Department, the standards of alignment and grade of the present highway were adequate for the small volume of slow moving traffic of that time.

Being on the portion of the main State Highway Route No. 2 between Los Angeles and Ventura, the volume of traffic using the road increased very rapidly from the date of its original construction. The average speed of vehicles likewise increased so that within a few years the sharp curves of the old route became more and more hazardous to traffic and the number of accidents increased constantly.

JUSTUS F. CRAEMER

TRAFFIC FAVORED NEW ROUTE

By 1929, when the new Coast Highway route was completed between Oxnard and Santa Monica, the old route was overcrowded and some of the sharper curves on the Conejo Grade had become quite dangerous. As a result traffic showed a preference for the new route so that about 60 per cent of the coast traffic followed the Oxnard-Santa Monica Route and only 40 per cent chose the old route. Truck traffic especially preferred the "sea level" route to the steep grades, narrow roadbed, and inferior alignment of Conejo Grade.

In 1929 it was decided that, by expending a comparatively small amount of money on widening curves, additional safety could be provided for traffic until the necessary relocation of the grade could be made. A small state crew equipped with a power shovel was then started on the improvement of the worst curves on the old grade and continued this work for about one year. A much safer alignment has resulted but it was realized from the start that this could not adequately provide for traffic for an indefinite length of time.

FATAL ACCIDENT HISTORY

During 1932 and 1933, figures furnished by the California Highway Patrol indicate that in four accidents on this grade, no less than seven persons were killed and four were seriously injured. It was evident that only by making a radical change in alignment over the whole section from Newbury Park to Conejo Creek could a permanently satisfactory highway be provided.

This "Ventura Boulevard" route, as the route which includes Conejo Grade is known, contrary to the general belief, is actually a few miles shorter between Ventura and the business district of Los Angeles than the

(Continued on page 14)

CONEJO GRADE, an obsolete section of the Coast Highway in Ventura County, soon to be replaced by new highway on improved alignment. Built in 1912 it has been the scene of many accidents because of its steep grades and sharp turns. The new routing will be straighter, safer and nearly a mile shorter

THIS IS ONE of 49 curves that make the existing Conejo Grade a menace to traffic. A total curvature of 2067 degrees will be reduced to 367 degrees and the curves to only 12 in number on the new location routing.

THE REALIGNMENT indicated by white line will cut across part of an old oil field that has long been an interesting sight to tourists. It is a shallow well field and the little oil wells are operated by single cable lines.

Nojoqui Grade Completion Eliminates 33 Curves on Coast Highway Route

By **L. H. GIBSON**, District Engineer

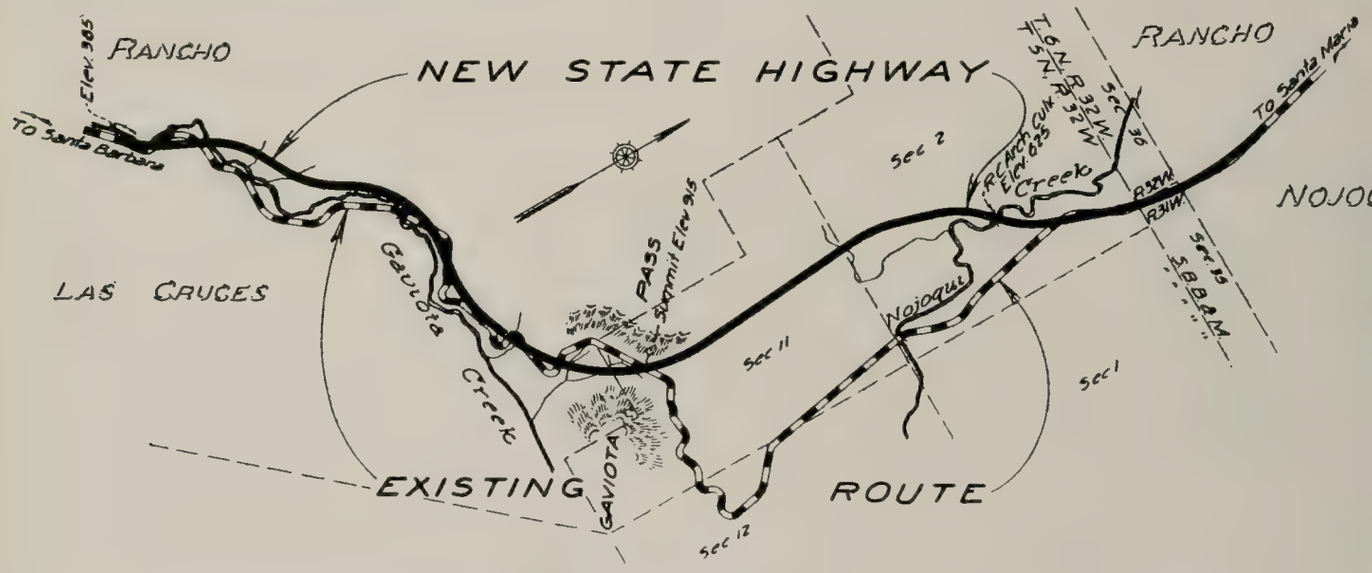
WORK was completed in the latter part of October on the Nojoqui Grade Relocation project in Santa Barbara County, between Las Cruces and four miles south of Buellton, and the motorist traveling the Coast Highway (U. S. 101) will be agreeably surprised to find the forty-four tortuous curves on the old road reduced to eleven of long radius and clear vision.

Also, it will be apparent from the speedometer reading that the new road shortens the traveling distance by nearly one mile, and more noticeable yet will be the time saving factor, especially compared with the frequent delays caused along the old route when encountering heavily ladened trucks.

excavation, about 200,000 cubic yards, was removed from a single cut at the summit of Gaviota Pass.

Shortening the length of the project, and reducing some old 7 per cent grade to a 6 per cent maximum on the new road made it necessary to cross the summit 40 feet below the old road which was itself in a 25-foot cut. The slopes of this cut were stepped back at two separate levels to prevent slides developing, and one of the benches was used as a detour during construction. Almost the entire excavation was handled in an efficient manner by a fleet of twelve cubic yard carryall scrapers.

Surfacing is of the standard 20′ x 0.75′–



NEW NOJOQUI GRADE location is shown by heavy black line, old route by dotted line

This new road, although only 3.7 miles in length, represents a noticeable improvement which is readily brought to mind by the fact that the motorist in negotiating the forty-four curves on the old route turned through 2305° of curvature, or the equivalent of making about 6½ complete circles over the length of the project, while on the eleven curves on the new alignment only 373° of curvature are to be found, or the equivalent of only slightly over one complete circle.

The entire project was characterized by heavy grading, the final analysis showing that about 670,000 cubic yards of excavation were moved which gave an average of 180,000 cubic yards per mile. A major portion of this

0.55′–0.55′–0.75′ portland cement concrete reinforced with dowels, supported by cross bars, at the regular transverse expansion and weakened plane joints.

SUBGRADE MATERIAL IMPORTED

The local excavated material did not meet requirements for subgrade on which to place high type pavement and it was necessary to employ some method of subgrade stabilization. This was accomplished by placing an imported selected material subbase to a depth of about 9 inches under the pavement and 4 inches on the shoulders. Prior to placing the selected material the subgrade of local material was rolled and sealed with a bituminous mem-

(Continued on page 22)

NOJOQUI GRADE through Gaviota Pass in Santa Barbara County has been transformed from a narrow, tortuous series of 44 sharp curves to a wide highway with only 11 long radius curves.

NEW ROUTE climbs through the hills on an easy 6 per cent maximum grade made possible by deep cuts representing 670,000 cubic yards of excavation and shortening the distance by nearly a mile.

OLD ROUTE abounded in hairpin turns such as the two shown in the above picture taken before the improvement when traffic was compelled to loiter along behind heavily laden trucks.

Conejo Relocation Involves Problems

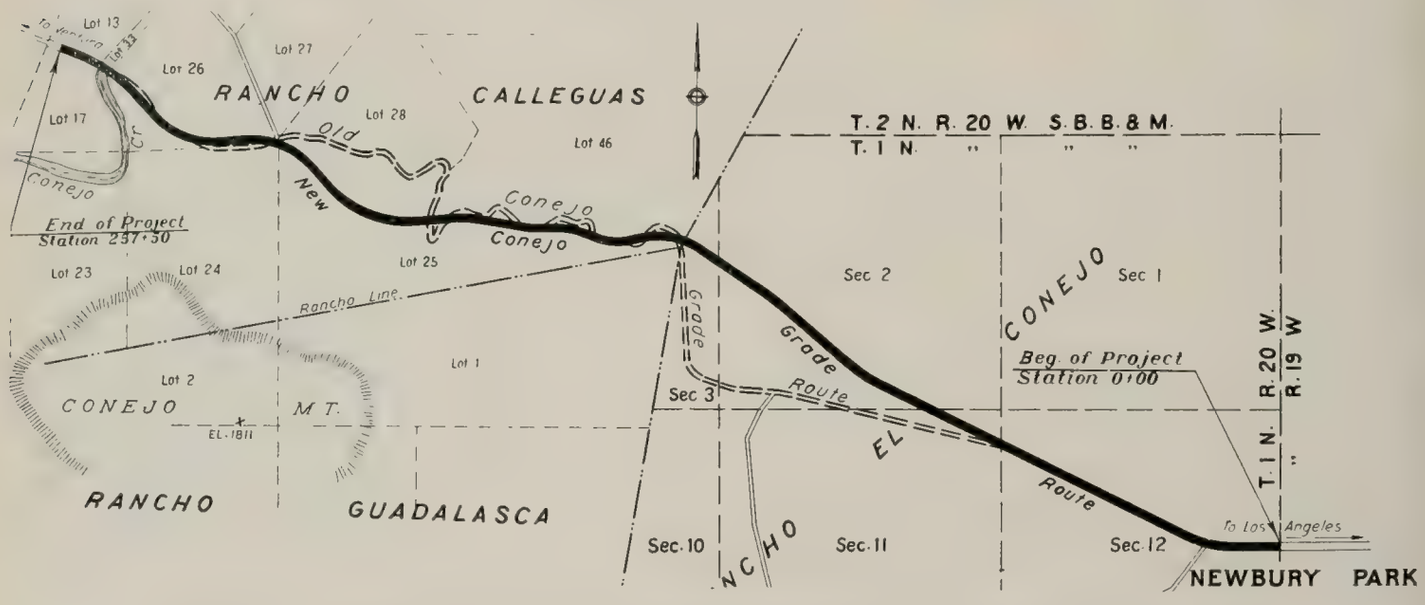
(Continued from page 10)

Oxnard-Santa Monica route and many trucks as well as passenger cars would prefer it to the coast route if Conejo Grade were improved to requisite modern standards.

PRESENTS TECHNICAL PROBLEMS

The relocation of this section across the low Conejo Range of mountains has presented many technical difficulties. The old location, although in general fairly direct, necessarily had many short radius curves in order to keep construction costs to a minimum as well as keep within the allowable 6 per cent maximum grade.

Preliminary studies were started in 1927 looking to the relocation of the route and



HEAVY BLACK LINE shows new alignment compared with old Conejo grade

though many possibilities were considered these studies resolved themselves in general into three alternative routes. These were known as the "North Route," the "Middle Route" and the "South Route."

The "Middle Route" was by far the most direct alignment but on account of its directness would necessitate a grade for a portion of the distance in excess of 6 per cent. However, far better alignment could be secured by adopting this route, as well as keeping curvature to a much lower figure than on either of the other two routes.

MIDDLE ROUTE SHORTER

The advantages of the North and South routes were that flatter grades could be obtained although the reduced percentage of grade would require considerably more curvature and distance. On account of the more direct alignment to be secured by adopting the Middle Route, a material saving in distance and consequently in cost was possible.

All of these matters were carefully considered in arriving at a decision as to the route finally adopted. Surveys indicated that by using a 7 per cent grade for the two miles down the west slope of the Conejo Range, the Middle Route could be used and thus secure the advantages of better alignment and shorter distance. The advantages of this route were so great as to outweigh the slight disadvantage of a two mile length of 7 per cent grade, and the Middle Route was therefore adopted.

NEARLY MILE SAVED

The length of the improvement will be 4.83 miles with a saving in distance of .84 mile over the present route. Some idea of the value of this project to traffic may be obtained from the following comparison of the new and old routes:

	Existing	Proposed
Length in feet	29,404	24,950
Maximum elevation	771	837
Total number of curves	49	12
Total degrees of curvature	2,067	373
Minimum radius of curvature	65	1,200
Width of roadbed in feet	30	46**

**8' oiled shoulder to be constructed on each side.

(Continued on page 22)

Work Put Under Way Last Month

The following tabulation lists the contracts awarded and pending award and projects advertised by the Division of Highways between the dates October 1, 1935, and November 1, 1935. The work thus put under way includes 50 miles of grading, paving and bituminous crushed rock surfacing, 4 overhead crossings, 2 grade separations, an underpass and a pedestrian stairway:

County	Location	Miles	Type
Alameda	Bay Bridge to Folger Ave. Subway	4.0	Pavement
Alameda	In Albany near El Cerrito Hill		Overhead crossing
Contra Costa	At Maltby, near Concord		Overhead crossing
Imperial	4 miles west of Westmorland to Trifolium Canal	3.2	Bit. tr. rock surface
Los Angeles and Kern	¼ mile south of Kern Co. Line to Fort Tejon	5.5	Pavement
Los Angeles	Rosemead Blvd., San Gabriel Blvd. to Ramona Blvd.	3.5	Pavement
Los Angeles	In Santa Monica at Palisades Beach Road		Pedestrian stairway
Los Angeles	In Newhall, San Fernando Road from 4th St. to Placerita Road	0.8	Pavement
Los Angeles	Verduga Road to Flintridge Country Club	1.4	Pavement
Monterey	In Salinas		Underpass
Monterey	At Thompson Gulch	0.2	Bit. tr. rock surface
Orange	At Newport Beach		Grade separation
San Diego	At Santa Margarita River	0.6	Grading
San Diego	Near Del Mar		Overhead crossing
Solano	Fairfield to Vacaville	3.8	Pavement
Salano and Napa	Carquinez Bridge to Cordelia	11.2	Pavement
Ventura	12.5 miles north of Ventura		Drainage
Lassen	Long Valley Creek to 2.8 miles north of Route 21	9.2	Grade and surface
Sacramento	Courtland to Freeport	0.4	Slope protection
Santa Clara	On Almaden Rd. near San Jose		Grade separation
Monterey	At Molera Ranch	1.8	Grade and surface
Ventura	Newbury Park to Conejo Grade	4.8	Pavement
Riverside	Near Beaumont		Overhead crossing

Newman-Crows Landing Realignment Abolishes Bad Turns, Saves Over Mile

By **R. E. PIERCE,** District Engineer

WITH appropriate ceremonies participated in by state, county and civic officials, the newly completed realignment of that portion of State Highway Route No. 41 between Newman and Crows Landing in Stanislaus County was officially dedicated and opened to the public on Monday, November 11th.

This road, known as the West Side Highway and extending from near Tracy on State Route No. 5 to King's River Canyon via Fresno and General Grant Park is the main road serving the communities on the west side of the San Joaquin Valley south of Tracy. It is one of the county roads taken into the state secondary system by the 1933 legislature.

MANY SHARP CURVES

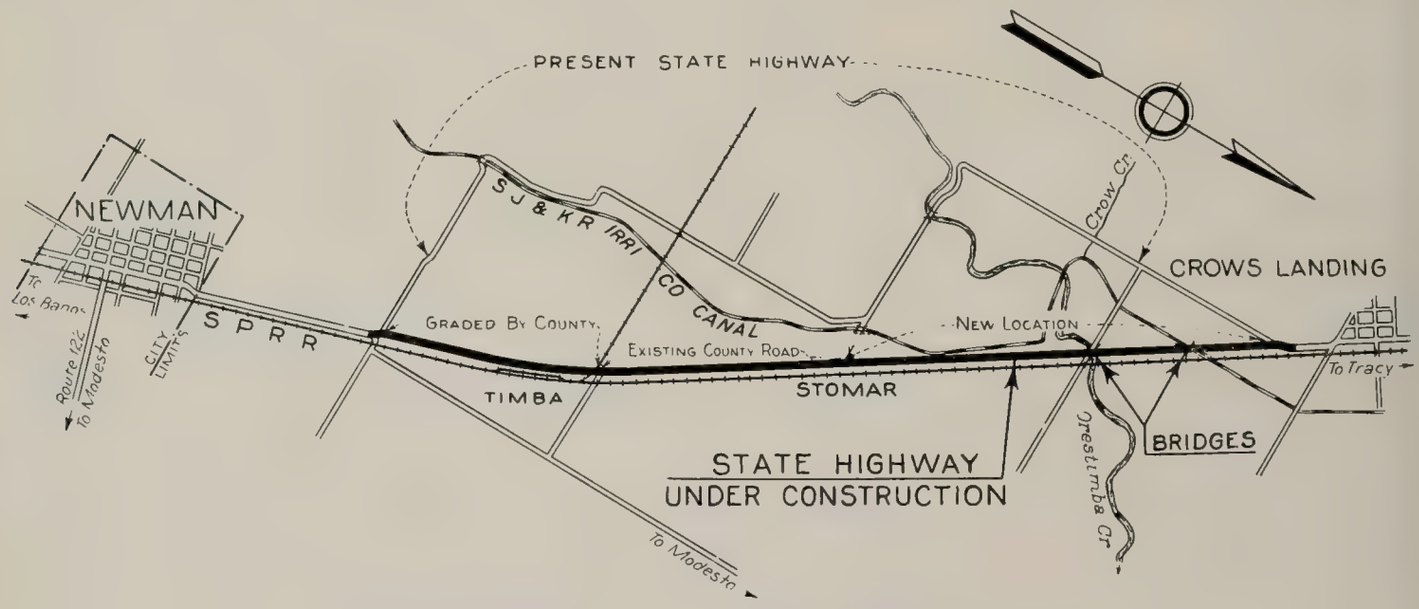
Referring to the accompanying map it will be noted that the existing road leaves the vicinity of the Southern Pacific Railroad line a short distance north of Newman and has numerous sharp turns and curves before it again returns to the railroad a short distance south of Crows Landing.

Some of these curves on the old road have a very bad accident record, one in particular, which turns sharply off a bridge over an irrigation canal, has been the scene of many accidents and some deaths.

The present road is an example of location following the line of least resistance along an old meandering county road instead of by the direct route along the railroad as the state has built.

MILE AND HALF SAVED

The old road has several right angle turns as well as numerous sharp curves with restricted sight distance. The new road, aside from the long, easy, reversing curves at each end made necessary by the fact that the county road is centered on a narrow right of way while the new location is centered on an 80 foot right of way, has only one curve, paralleling the railroad curve, with a radius of 11,369 feet. A saving of nearly 1½ miles in distance is made by the new location.



SKETCH MAP of Newman-Crows Landing realignment

The improvement is 4.54 miles in length, and consisted in general of constructing a roadbed 32 feet wide, with a crushed gravel base and road-mix oil surface 20 feet wide.

Two timber bridges 24 feet wide have been constructed, one over Orestimba Creek 136 feet long and one over an irrigation canal 119 feet in length.

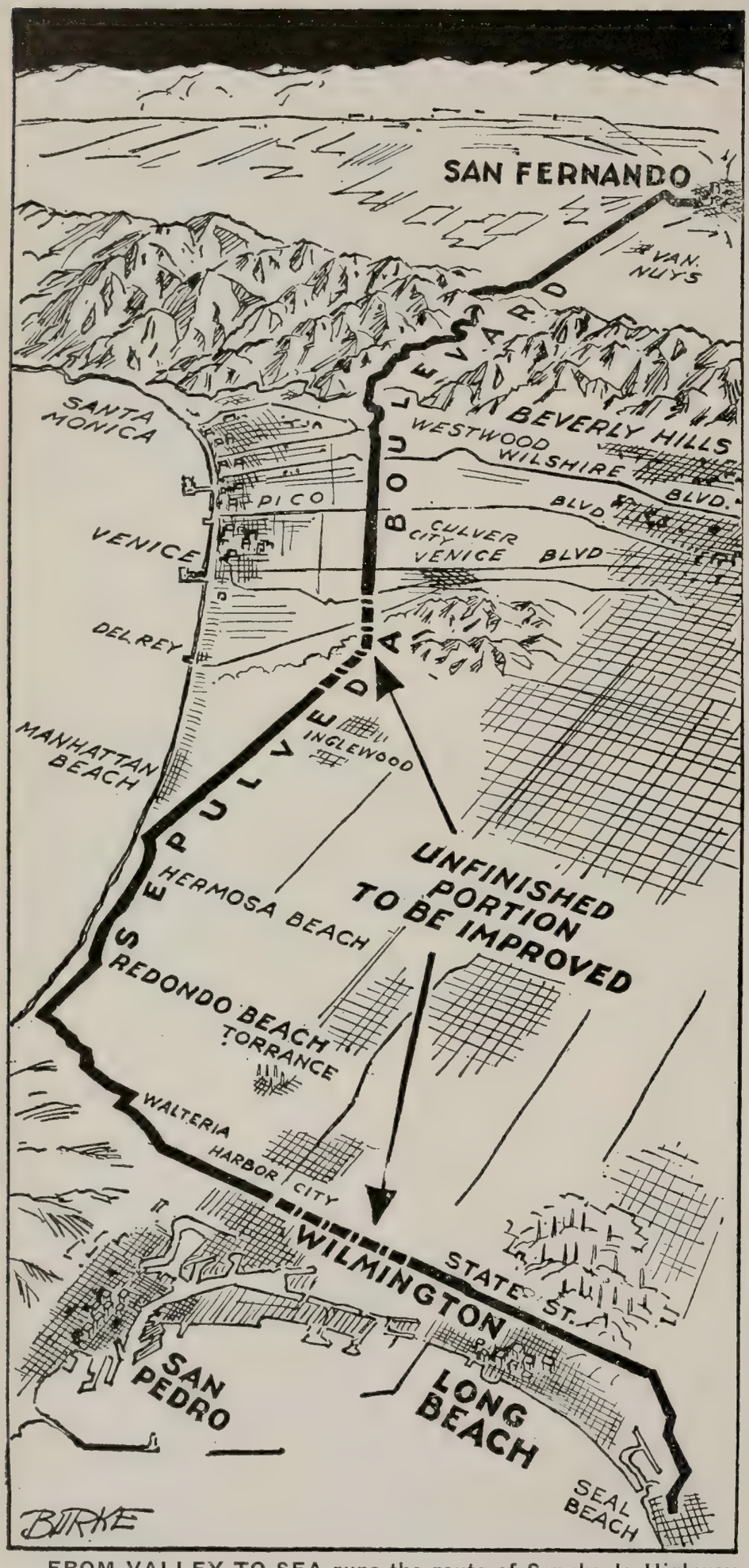
The county authorities, especially the Board of Supervisors, through their local representative, F. R. Raines of Westley, supervisor of

(Cntinued on page 22)

STRAIGHT AND WIDE runs the new highway for 4.54 miles between Newman and Crows Landing on State Route No. 41, cutting out many dangerous curves on the narrow old county route.

RIGHT ANGLE TURNS were responsible for a bad accident record on the six mile stretch of old highway, one in particular being the scene of several fatalities. Two of these turns are pictured.

AT THE DEDICATION ceremonies on Armistice Day hundreds of citizens gathered and automobiles lined the highway for several miles near the speakers' stand midway between Newman and Crows Landing.



FROM VALLEY TO SEA runs the route of Sepulveda Highway of which the key section through Santa Monica Mountains was recently dedicated. Sketch showing completed and unfinished portions reproduced through courtesy of Los Angeles Examiner.

New Sepulveda Link Includes Mountain Tunnel

(Continued from page 4)

communities which left Seal Beach at noon. The parade continued to Ventura Boulevard, returning in double column to the celebration site in time for the gala dedication fiesta. This caravan was joined by gayly-dressed equestrians from the adjoining ranchos when it neared the dedication site, approximately one-half mile north of Sunset Boulevard.

FINANCED BY GAS TAX

This newly opened section, seven and six-tenths miles in length, extends from Ventura Boulevard on the north, south through the Rancho San Vicente to Sunset Boulevard. Surfacing of this section with 30-foot asphaltic concrete pavement bordered on each side by oil treated rock shoulders, at a cost of $300,000, was completely financed out of revenues derived from the state gasoline tax. Grading had previously been completed in 1930.

To the motorist traveling north from Sunset Boulevard, the road, built on easy grade and gentle, winding curves, traverses some of Southern California's most beautiful scenery, bounded on each side by the heavily wooded slopes of the Santa Monica Mountains.

TUNNEL THROUGH MOUNTAINS

These first impressions are climaxed at the summit where, upon emerging from the north portal of a 665 foot tunnel bored through the mountains 130 feet under Mulholland Drive, a vast panorama of the San Fer-

(Continued on page 30)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California, published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 NOVEMBER, 1935 No. 11

SEPARATING GRADES

Approval by the President of $642,000 in payment for grade crossing elimination projects under way in this state serves to call attention to this work being carried on by the California Highway Commission under the federal grants. Of the $220,000,000 set aside from the four billion works relief fund for crossing elimination California has been allocated $7,500,000.

Like all public works projects, the idea that grade separation work could be got under way promptly has proved illusory. George T. McCoy, assistant state highway engineer, points out that often a great deal of preliminary work is required in getting agreements for acquiring property, moving buildings, relocating roads and the like. Then the Government's requirements as to relief labor, distribution according to railway mileage and other restrictions add to the complication.

Nevertheless thirty-nine grade separation projects have been worked out to come within the PWA's seven and a half million allocation. Within the limitations imposed an effort has been made to remove the worst traffic menaces. Helpful in this work were statistics kept by the California Railroad Commission since 1926 showing that 40 per cent of accidents occurred at 3 per cent of the state's 12,500 grade crossings.—*San Francisco Chronicle.*

ONE EYE OPEN

Mrs. A—My husband has no idea what I go through when he snores.

Mrs. B—Mine never misses his small change either.

If you must have a blowout have it at home.

U. S. Will Construct Three Bridges Along Inter-American Road

PRESIDENT ROOSEVELT has approved a program of bridge construction work on the route of the Inter-American highway in Central America, the U. S. Bureau of Public Roads, in charge of activities on the highway, announces.

Congress in June, 1934, appropriated $1,000,000 "to meet such expenses as the President in his discretion may deem necessary to enable the United States to cooperate with the several governments, members of the Pan-American Union, in connection with survey and construction of the proposed Inter-American Highway." As the initial activity under this program, the Bureau of Public Roads has undertaken the construction of several bridges in Panama, Guatemala and Honduras, the estimated expenditure being $340,000.

THREE BRIDGE LOCATIONS

The bridges are as follows: Republic of Panama—bridge over the Chiriqui River, approximately 600 feet long; Honduras—bridge over the Choluteca River, approximately 600 feet long; Guatemala—bridge over the Tamazulpa River, approximately 300 feet long.

The United States will furnish surveys, plans, specifications, and estimates for the bridges, all steel or other fabricated material for structures, mechanical equipment, and transportation to site of work. It also will construct the superstructure, supervise all construction, and furnish all inspection and supervision when needed in connection with getting out materials furnished by the other country.

LOCAL PARTICIPATION

The other country will furnish all local materials, labor and transportation incident thereto, together with rights of way, and labor needed in constructing foundations, substructures, and grading approaches for a distance sufficient to complete the stream crossing and make the structure usable.

The Inter-American highway route traverses Mexico and the republics of Central America, its termini being Nuevo Laredo, Mexico, across the Rio Grande from Laredo, Texas, and Panama City.

Be sure the only crank in the car is in the tool box.

State Completes Alemany Link With San Francisco's Boulevard System

By **JNO. H. SKEGGS,** District Engineer

THE San Francisco Peninsula has long been a problem as far as highway development is concerned.

Bounded on the west, north and east by the Pacific Ocean and San Francisco Bay, the only outlet for the motor vehicle traffic of the city of San Francisco except via ferries or toll bridge is to the south.

The city of San Francisco has been developing an extensive boulevard system in the city, and also has contributed to the development of several highways outside of the city.

The state has taken a number of city streets into the state highway system, and has recently supervised the expenditure of about one-half a million dollars of federal apportionment funds in improving some of the major streets forming connections and feeders to the two bridges now under construction across San Francisco Bay.

LATERAL HIGHWAY NEEDED

In order to allow for segregation of traffic between the major highways leading to the south, it is necessary to construct laterals.

For this purpose the city has constructed the Alemany Boulevard from the Bay Shore Highway to the Junipero Serra Boulevard, just north of the south city limits.

In order to allow completion of this lateral to connect with the Skyline Boulevard, the state has constructed the section from the westerly end of the Alemany Boulevard near Daly City, westerly to the Skyline Boulevard at Thornton, 1.7 miles, all in San Mateo County. This now becomes State Route No. 56 in lieu of the section of the old Edgemar Road from San Pedro Avenue (and Edgemar Road) to junction with the Skyline Boulevard.

The project, financed from federal apportionment of Federal Emergency Relief funds for 1935, was let to contract in March, 1935.

The work consisted of constructing a graded roadbed 56 feet wide and placing a bituminous treated, crushed gravel or stone surfacing 42 feet wide and 0.25 foot thick, on a crusher run base 0.50 foot thick.

The major contract items were 244,000 cubic yards of roadway excavation, with about 2,000,000 station yards of overhaul. Crusher run base was placed in the amount of about 16,750 tons, with 6000 tons of treated surface.

MAP of completed project shown by heavy black line.

Several deep gulches required 30 inch and 72 inch culverts, and adjacent to the Junipero Serra Boulevard, it was necessary to move a 54 inch and a 30 inch water main belonging to the San Francisco Municipal Water Department.

The water mains, being the principal source of water from the Calaveras and Hetch-Hetchy water sheds, speed in changing, and extreme care were required not to interfere seriously with the cities' water supply.

The excavated material involved in the project was chiefly sand, and while a large

(Continued on page 22)

ALEMANY BOULEVARD EXTENSION just completed by the State in San Mateo County connecting Skyline Boulevard and Junipero Serra Highway required 244,000 cubic yards of roadway excavation with 2,000,000 station yards of overhaul. The new highway is 1.7 miles in length and slopes are extensively planted. Upper inset shows part of grading operation. Lower inset shows Skyline intersection.

Conejo Grade Will Have Third Lane to Permit Passing

(Continued from page 14)

In general a 20-foot concrete pavement will be constructed on a 46-foot roadbed although on the grade down the westerly slope of the range two 10-foot strips of concrete pavement will be separated by a 10-foot width of plant-mixed oil surfacing. This will provide a 10-foot traffic lane between the concrete strips for vehicles to pass on the grade.

On some of the high fills, oil and rock surfacing will be used instead of concrete pavement until the fills have had time to attain their full settlement. Shoulders throughout the length of the project will be oiled the full width of roadbed, thus providing ample space for vehicles to park well off of the paved area.

Preliminary estimates indicate that 770,000 cubic yards of excavation and 5,300,000 station yards of overhaul will be required for the grading of the project and 6660 cubic yards of concrete pavement will be placed.

Approximately one year is being allowed in which to complete the contract so that by the latter part of 1936 it is expected the new road will be opened to traffic.

At the westerly end of the project the present bridge across Conejo Creek is to be widened under separate contract to a width of 44 feet to conform to the width of roadbed on each side.

NEWMAN-CROWS LANDING REALIGNMENT ABOLISHES BAD TURNS

(Continued from page 16)

the 5th District, have shown a fine spirit of cooperation by building the right of way fences on the entire project, as well as extending a timber cattle pass beneath the railroad to connect with one built under the new highway.

The dedication ceremonies were held on the new highway midway between Crows Landing and Newman. Among the speakers on the program were President Arthur Rathaus of the Newman Chamber of Commerce; President C. R. Perrier of the West Side United Chambers of Commerce; E. K. Finney, chairman, Board of Supervisors; J. F. Blakely and F. C. Tatton of California State Chamber of Commerce.

5000 Cu. Yds. Per Day Moved by Tractors on Alemany Project

(Continued from page 20)

amount of material was involved, the work was performed with exceptional speed and ease, as shown by the fact that it was possible to move 5000 cubic yards per day, using three 80 h.p. tractors with three 12 cubic yard carryalls, and operating three 6-hour shifts per day.

The alignment is exceptionally good, being one tangent with sweeping curve connections to the boulevards at either end of the project. Grades are light, and a connection is now being made to the Merced Boulevard near the center of the project.

TRAFFIC GREATLY INCREASED

The resulting highway is a splendid sample of this type of temporary road as developed to allow cheap construction pending final settlement of fills, etc., together with a serviceable roadway for fast and heavy traffic.

As soon as it was possible to travel the road, the motoring public did so, and to date the traffic has increased so fast that it is estimated that there are 1000 machines a day using it. This will be greatly augmented when the adjacent section to the south from Thornton to Edgemar, now under contract, is completed.

The total cost of the project is approximately $135,000.

33 CURVES ELIMINATED ON COAST HIGHWAY ROUTE

(Continued from page 12)

brane of Grade E asphalt to prevent moisture or water percolating upwards into the selected material subbase.

At Nojoqui Creek a 14 x 16 foot reinforced concrete arch culvert was constructed. A feature of this structure was the adoption of a heavily reinforced concrete arch invert in order to adequately support the structure which was situated over soils incapable of supporting the load imposed by using the customary footings for such structures.

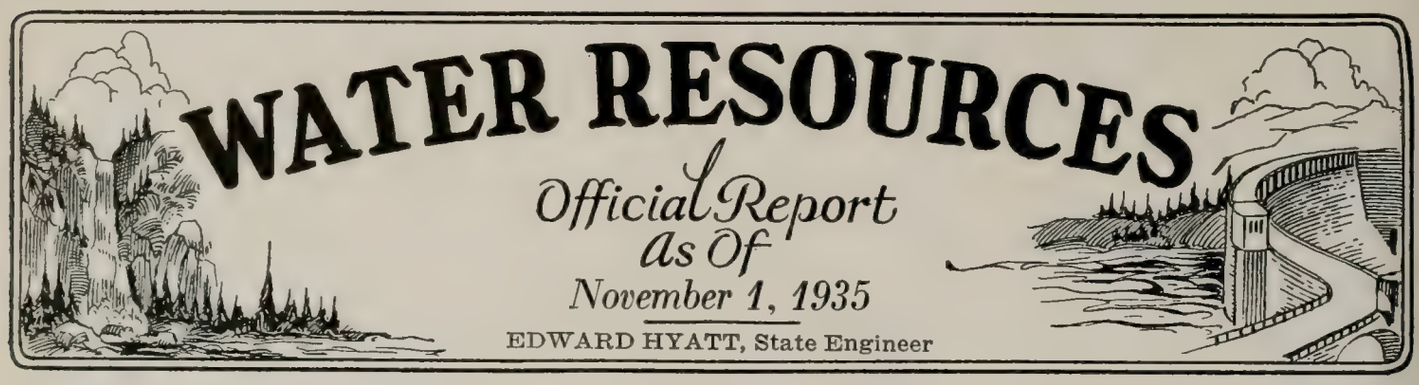
The project was advertised for competitive bids and awarded to the lowest bidder.

The cost aggregated a total expenditure of about $425,000.

LIKE FLIES ON A WALL these workers are clinging with the aid of ropes to the precipitous face of Grizzly Dome in Feather River Canyon on the location of the new highway being constructed through that rocky mountain gorge.

They are part of a drill crew engaged in blasting and excavation work on East Portal Tunnel No. 2 through which the highway will be carried under the huge granite mass of Grizzly Dome that blocks the line of the highway.

Excellent progress has been made in completing West Portal Tunnel No. 2 at Grizzly Creek where widening operations are now in progress.



The U. S. Bureau of Reclamation is making progress in initiating work on the Central Valley Project in California for which the President has approved an initial allotment of $15,000,000. Their engineers have been in the State during the past month studying the various units of the project proposed for immediate construction and are working closely with the State Engineer in laying out their program.

The project will be broken down into units in order to provide an orderly construction program fitting Works Progress regulations.

Walker Young, Construction Engineer of the U. S. Bureau of Reclamation, has been placed in charge of the project and is now in Sacramento organizing his office and personnel preparatory to getting the work started. He has located his headquarters at least temporarily, in the Federal Building at 9th and I Streets, Sacramento.

IRRIGATION DISTRICTS

This office is engaged in a revision of Bulletin No. 18, "California Irrigation District Laws." The revised edition of this bulletin will contain the California Districts Securities Commission Act, the California Irrigation District Act and related laws, California Water Storage District Act, California Water Conservation Act of 1923, California Water District Act and the County Water District Act, all as amended to 1935.

The formation of the North Kern Water Storage District, Kern County, was approved in an organization election held on October 8, 1935.

CALIFORNIA DISTRICTS SECURITIES COMMISSION

The Securities Commission approved expenditures from the general funds of the following districts operating under Section 11 of the California Districts Securities Commission Act:

Carmichael Irrigation District, changes in pumping plant ---------- $1,700
Fairoaks Irrigation District, replacement of pipe lines ---------- 6,300
West Side Irrigation District, installation of drainage wells ---------- 3,000

Orders were issued to the following districts:

Tracy-Clover Irrigation District: Approving the voting of $20,000 in refunding bonds and expenditures in connection with the same; approving plan of debt adjustment under the Federal Bankruptcy Act.

Scott Valley Irrigation District: Approving the voting of refunding bonds in the principal amount of $67,000, to be exchanged for a like amount of outstanding bonds.

Santa Fe Irrigation District: Validating refunding bonds in the principal amount of $394,500 to be issued to the Reconstruction Finance Corporation.

FLOOD CONTROL AND RECLAMATION

Maintenance, Sacramento Flood Control Project.

A crew has proceeded with routine maintenance during this period, on minor repairs to by-pass structures and bridges. The timber check gates at the three pumping plants have been examined and repairs made, following the lowering of water in the borrow pits. A small crew is engaged in clearing tule and water growth out of several of the drainage canals.

Repairs are being made on the bank revetment work in the Sacramento River at Freeport and Isleton.

Sacramento Flood Control Project.

The deputy in charge of flood control and reclamation has attended a number of conferences and has made three inspection trips with representatives of the U. S. Engineer Office and the Reclamation Board, in connection with the modification of the construction and bank protection programs proposed by Colonel Jackson.

Survey and planning of work in connection with incidental construction for the south levee of the American River has proceeded and construction will be commenced within a week.

The California Debris Commission has completed the construction of the Butte Slough Outfall Gates, consisting of seven 66-inch pipes with gates. The operation of this structure will be in charge of this division. The contractor for the three drainage pumping plants on the Sutter By-pass, under the California Debris Commission, has continued his work during the period, being somewhat delayed by lack of material. The final completion of the work will depend upon the delivery of some of the specially designed large pumping units, but it is expected that no difficulty will be encountered in caring for the winter drainage water.

Dam Repairs and Construction Rushed

(Continued from preceding page)

San Joaquin River.

Bids were opened on October 16th, for the construction of three units of levee in Reclamation District No. 2064, under the provisions of Chapter 365, Statutes of 1935. Two low bids at a price of 14 cents per cubic yard were received, and the Director of Public Works awarded the contract to J. C. Bolt of Stockton, the total cost being approximately $5,845.

DAMS

Application for construction of the White House Creek dam was filed on October 5, 1935. This is to be an earth dam 58 feet in height with a storage capacity of 970 acre-feet, situated on White House Creek in San Mateo County. The estimated cost of the structure is $7,500. The water is to be used for irrigation.

Application for the repair and alteration of the spillway and control works at Lake Francis dam of the Pacific Gas and Electric Company filed on October 2, 1935, was approved on October 14, 1935. The dam is situated on Dobbins Creek, tributary of Yuba River, in Yuba County.

Application for approval of plans for alteration of the Lower Peak Lake dam of the Pacific Gas and Electric Company was filed on October 2, 1935. This dam is located on a tributary of the South Yuba in Placer County. The application was approved on October 14, 1935.

On September 23, 1935, an application was filed for the repair of the Cummings Dam on Rock Creek in Modoc County. The application was approved on October 5, 1935.

The application for the alteration of the Bowman North Rockfill dam of the Nevada Irrigation District on Canyon Creek in Nevada County was approved on September 21, 1935.

The application of the Lava Cap Gold Mining Corporation, of Nevada City, California, for the enlargement of their log crib-earth filled dam in Nevada County was approved on October 5, 1935.

SAN GABRIEL WORK UNDER WAY

Work on the construction of the San Gabriel No. 1 dam of the Los Angeles County Flood Control District is proceeding under approval of the revised plans for the same by this division.

Work has been commenced on the Cajalco Dam of the Metropolitan Water District.

The stripping of the site and excavation of foundation for the Grant Lake Dam of the city of Los Angeles is progressing.

Construction of the city of Arcata's dam is under way.

Excavation of the cutoff trench at the West Valley dam of the South Fork Irrigation District in Modoc County has been practically completed in the low elevations of the structure and it is expected that fill construction will be under way within the next few days.

The work on all of the dams of the Santa Clara Valley Water Conservation District is proceeding satisfactorily and it is expected that on all except the Coyote dam, the fill will be completed within twenty or thirty days.

The work of stripping the foundation of Clear Creek dam on Clear Creek in Siskiyou County has been completed and the owner has decided to delay the pouring of concrete until next summer.

Construction of the Mad River dam of the city of Eureka is in the excavation stage.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Field work comprising measurements of the diversions, stream flow, and return flow in the Sacramento-San Joaquin territory is being brought to a close for the season. Office work in computing the diversions and compiling the data for the 1935 report will begin on the first of November.

Practically all diversions from the river have ceased for the season and this, combined with the run-off from the recent storm, had increased the flow of the Sacramento River at Sacramento to about 7500 second feet on October 18, 1935.

Salinity which this season encroached into lower Delta channels only, has begun to recede with the increased stream flow so that salinity of 100 parts of chlorine per 100,000 is now but a short distance above Antioch and Collinsville. The following tabulation for salinity at upper Bay and Delta stations as indicated by water samples taken on October 14th, is compared to the corresponding salinity on October 14, 1934.

Comparison of Salinity at Upper Bay and Delta Stations on October 14, 1934, and October 14, 1935.

Station	*Salinity in parts of chlorine per 100,000* *10/14/35*	*10/14/34*
Point Orient	1680	1720
Point Davis	1340	1610
Bullshead Point	1140	1410
Collinsville	130	620
Three Mile Slough Bridge	8	385
Rio Vista Bridge	2	220
Antioch	160	620
Central Landing	4	43
Dutch Slough	13	250

CALIFORNIA COOPERATIVE SNOW SURVEYS

Under an appropriation measure passed by the last Legislature, limited funds became available on September 15, 1935, for resumption by the Division of the project of Snow Surveys and forecasting of stream flow. This project was originally initiated in 1929 but State support was discontinued in June, 1933. Subsequent to that date, the snow sampling equipment was permitted to remain with the cooperating agencies and a number of these continued the surveys in the late winter and early spring of 1934 and

(Continued on page 28)

Highway Crew Fights Fire in Malibu Hills Saving School, Pupils and Homes

SURROUNDED by a wall of fire, employees of the Maintenance Department of the Division of Highways, District 7, valiantly fought the conflagration which last month swept through the beautiful Malibu hill region in Los Angeles County and by their efforts saved a number of homes and the schoolhouse in the Decker Canyon Settlement, which was directly in the path of the flames.

The highway maintenance men were assisted by the men, women and children of six families and Mrs. Weaver, the school teacher, who elected to remain with them in the imperiled area, refusing offers of the Division of Highways to move them and their household belongings in state trucks.

In a report to Director of Public Works Earl Lee Kelly, E. T. Scott, Maintenance Engineer of the Seventh District, forwarded an account of the fire fighting work of his crew written by Maintenance Superintendent Bernard M. Gallagher, and praises the members highly for their courage. Gallagher reported:

DISCOVERED FIRE IN HILLS

"Due to the heavy wind storm early in the morning of Wednesday, October 23, we instructed all the foremen to patrol the roads for fallen trees and other debris. John Schorr, who lives on Decker Road and works on the crew of Foreman Otto Apperson, notified Apperson that there were a few fallen trees and a large amount of brush and rock on Decker Road. Apperson immediately sent Schorr, C. F. Saman and William Dreasher in a truck up this road to clear it as he had been informed a fire was sweeping in that direction from Malibu and he wanted the road open.

"While the men were engaged in this work and had progressed to a point about nine miles inland, they discovered a fire just starting. This was about 11 o'clock in the morning. They at once notified Fire Warden Joe Ozanne.

REFUSED TO FLEE

"**Immediately thereafter they proceeded to notify the scattered residents in the district of the approach of the fire. Some of the residents moved out at once, but six families with sixteen children and the school teacher, Mrs. Weaver, decided to remain on the school grounds with the maintenance crew and assist in protecting the school and homes around it.**

"**John Schorr was urged to load his household effects on a state truck, but thought it would not be the right thing to do in view of the refusal of the other families to desert their homes. He hauled his furniture to the school house and put it in a corrugated iron garage. Sparks got inside the garage while Schorr was battling the fire and destroyed his furniture.**

"At 11.30, I went to our highway construction camp and asked Roy Alley, the foreman, to send up a truck and crew to the school to lend assistance. He dispatched Norton, Flores, Dituri, Kanchl, Smith, Housman, Bradley and Albanez to the scene and followed in his own car.

SCHOOL AND HOMES SAVED

"Our men started the pump near the school, filling the storage tank, water barrels and everything else available that would hold water. The fire hit them about 1.15 p.m. and passed over them.

"**They battled the flames for about 20 minutes and were able to save the school house, its outlying buildings and several homes nearby. But for the crew and the residents who remained with them the entire group of buildings and homes would have been burned.**

"The school is situated on an acre of ground that is cleared and is in a little valley between two hills on which was dense undergrowth. Four adjacent homes were destroyed, including the one rented by Schorr.

FLAMES 40 FEET HIGH

"**Schorr said that during the worst of the fire their location was surrounded by a wall of flames, some of which were 40 feet high.**

"I feel that our men, together with Mrs. Weaver, the teacher, and the families that

(Continued on page 32)

MALIBU FIRE SCENES where highway crew did heroic work. 1—Decker school; 2—Water tank; 3—School garage.

REMAINS OF FURNITURE moved for safety to school garage by John Schorr of highway crew.

WATER TANK where men waged desperate fight with flames to save only water supply.

BURNED AREA showing hundreds of acres surrounding little school community where flames raged leaving blackened hills denuded of trees and brush.

State Resumes Snow Survey Work on a Cooperative Basis

(Continued from page 25)

1935, but the data were not assembled and correlated and no forecasts were published by the Division.

Expenditure of State funds under this project has been made contingent upon like expenditure by the various cooperating agencies, Federal district, public utilities, etc., and these agencies have already submitted statements of the expenditures which they expect to make in cooperating on the Snow Survey work during the present biennium. The total of these statements has more than matched the State appropriation.

With the resumption of this work, the item of first importance during the past month has been the necessary field arrangements and survey preparations before the winter snows set in. Equipment and supplies are being checked and snow samplers and accessories replaced or added where necessary. It now appears that surveys may be anticipated at practically all of the snow courses surveyed prior to 1933 except that it may not be possible to obtain as many of the "key course" surveys formerly made monthly from the end of January to the end of April.

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty-four applications to appropriate water were received in September; 14 were denied and 20 were approved. In the same period 3 permits were revoked and 1 passed to license. Among the permits issued was one to the city of San Luis Obispo for 2.32 cubic feet per second and 1799 acre-feet per annum storage from Lopez Creek in San Luis Obispo County. The estimated cost is $600,000.

Field inspections of projects were made in Sacramento, Solano, San Joaquin, Stanislaus and Merced counties preparatory to the issuance of licenses confirming the rights under permits previously issued.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Topographic field work in connection with the Paynes Creek and Burney Quadrangles was carried on in Tehama and Shasta counties. Some progress was made in connection with office work on the Sebastopol Quadrangle in Sonoma County and office work on the Healdsburg Quadrangle in Sonoma County was completed. Some vertical control work was done on the Krayenhagen Hills Quadrangle in Fresno County. Final sheets of the Los Alamitos Quadrangle in Orange County are now available. This sheet is done on a scale of 1:31,680 with a contour interval of 5 feet.

The final map of the Sylmar Quadrangle is now available. This covers an area in Los Angeles County on a scale of 1:24,000 with a contour interval of 5 and 25 feet, the work being done by Los Angeles County in cooperation with the Geological Survey.

Santa Monica Flat Arch Tunnel Built in 40-foot Sections

(Continued from page 2)

contract was awarded for driving the 708 concrete piles required for the tunnel footing. Piles were driven at approximately three foot centers to a bearing of 40 tons and the average penetration of the piling was 17.5 feet. It was necessary to closely watch the banks during the driving operations as the jar tended to cause slides. One major slide of 200 cubic yards partly buried two men working close to the bank.

The temporary trestle of the Pacific Electric line was constructed with a removable span over each footing and when the driver reached this point, the removable span was lifted out by a track crane and the driver taken through the opening, driving pile as it went through. This work was done between the hours of 1 and 5 a.m. when there were no train movements.

Upon the concrete pile heads a reinforced concrete footing block was cast 3½ feet thick and 10 feet wide which formed the foundation of the tunnel proper.

FLAT ARCH ROOF

The tunnel is a rigid frame structure resembling a very flat arch with a span of 56 feet and has a clearance above the pavement of 21 feet. The tunnel is being constructed in 40 foot sections and each of these sections contains approximately 420 cubic yards of concrete and 32 tons of bar reinforcing steel.

Concrete for each section was poured in three operations, the walls, the haunches and then the crown portion. Transit mixed concrete is being used throughout as there is no space available for the storage of materials at the job.

The cost of falsework upon a project of this size is of primary importance as approximately 35,000 feet B.M. of lumber is required for the centering and sheeting of each 40 foot section. As all of the tunnel sections are similar, the contractor conceived the idea of building the falsework in two parts, the lower part being a series of framed bents and the upper part a series of trusses resembling roof trusses.

Joists cut to the shape of the arch were supported by these trusses and the joists were sheeted with two-inch material. A six-inch wedge space separated the two parts of

(Continued on page 32)

Old Timer, Do You Hold a Card to Beat This?

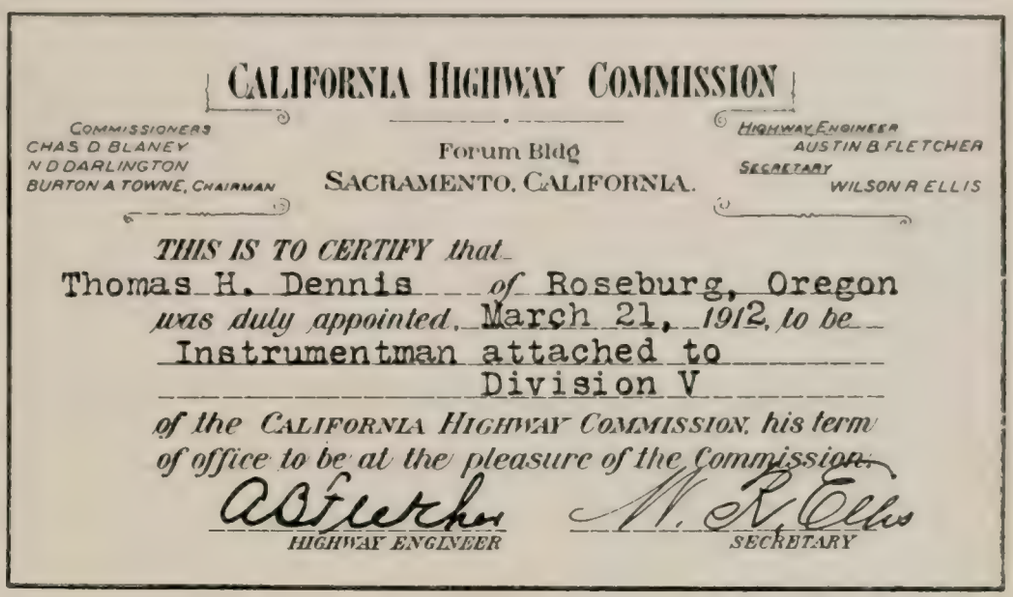
THE honor of being head man in the Old Timers' Club of the State Division of Highways, originally the California Highway Commission, goes this month to Thomas H. Dennis, Maintenance Engineer of the Division.

Membership requirement is possession of one of the identification cards issued by the old California Highway Commission to every man appointed on the staff of a division engineer. Mr. Dennis produced two such cards. One certifies to his employment as instrument man attached to Division V, San Luis Obispo, under Division Engineer W. S. Carruthers, on March 21, 1912. Mr. Dennis worked five months in this capacity and then was transferred to Division III, which then embraced Sacramento and Stockton, as Chief of Party, August 26, 1912. His second card bears this date.

This same date appears on the card sent to the California Highways and Public Works last July by E. H. Cameron, Construction Engineer of District 1, who, on August 26, 1912, was appointed a transitman. Mr. Cameron expressed a wish to hear from any old timer who had a card antedating his.

M. E. Tozer, 702 West 8th Street, Santa Ana, assistant bridge construction engineer of the Division of Highways in District 7, promptly sent in his application for membership in the Old Timers' Club in the shape of an identification card issued to him as a draftsman in District 5 by the Highway Commission, and bearing the date June 24, 1912. That placed him ahead of Mr. Cameron.

And now comes forward Maintenance Engineer Dennis and tops them both.



CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

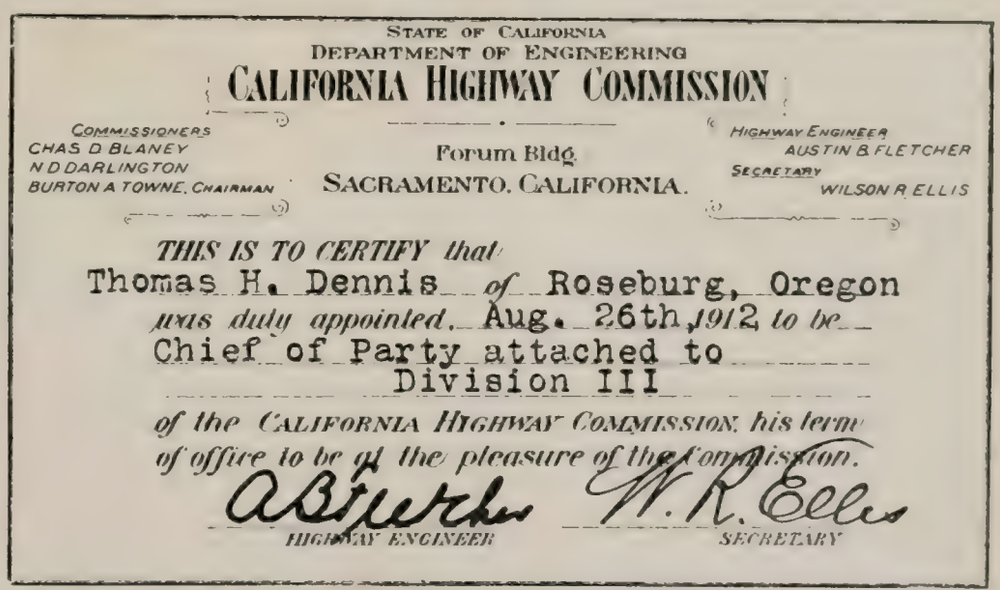
Forum Bldg
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
Thomas H. Dennis of Roseburg, Oregon
was duly appointed, March 21, 1912, to be
Instrumentman attached to
Division V
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A B Fletcher — HIGHWAY ENGINEER
W. R. Ellis — SECRETARY

FIRST CARD issued to T. H. Dennis, August 26, 1912



STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING
CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

Forum Bldg
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
Thomas H. Dennis of Roseburg, Oregon
was duly appointed, Aug. 26th, 1912, to be
Chief of Party attached to
Division III
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A B Fletcher — HIGHWAY ENGINEER
W. R. Ellis — SECRETARY

RAPID PROMOTION is shown by this card issued March 21, 1912

These veterans are proud of their state service. They prize their old identification cards highly. They invite other old timers to dig among their keepsakes and produce equally ancient cards.

The original California Highway Commission was appointed in 1911 and on January 2, 1912, the first seven division engineers reported for duty.

The first shovel of earth on the first highway contract was turned in San Mateo County on August 7, 1912, by Burton Towne, chairman of the Highway Commission. Contract Number One under the original bond issue called for a highway between South San Francisco and Burlingame.

California and Nevada Join in Dedication at Montgomery Pass

By **S. W. LOWDEN**, Acting District Engineer

CALIFORNIA participated with Nevada in paying tribute to the efforts of early pioneers and present day boosters of the all-year highway across Montgomery Pass on Sunday, October 6, 1935, when ceremonies held at Mount Montgomery Summit officially and formally opened the new oiled highway extending from Tonopah and central Nevada to Bishop and southern California.

Approximately 300 people attended the dedication under the clear blue skies at the little mountain community which faces the White Mountains, no less majestic in their rugged grandeur than the Sierra barrier on the west.

State Controller, Henry Schmidt of Nevada officially represented Governor Kirman of that state, while California was represented by a group of citizens, among whom were G. W. Dow, G. W. Savage, William Chalfant, W. A. Crosby, Joe Riley and others.

NATIONAL HIGHWAY LINK

Many letter and telegrams were read congratulating and praising the completion of the work as an important link in the national highway system.

The speakers included E. C. Brown of the U. S. Bureau of Public Roads; William Davis, manager Nevada State Automobile Association; Forest Lovelock, prominent Tonopah business man; L. F. Deckelman, representing the American Legion; S. W. Lowden, acting District Engineer, Division of Highways, Bishop; W. A. Crosby, representing the Automobile Club of Southern California and G. W. Dow, president of the Three Flags Highway.

The road has an historic past, and many persons now residing in Owens Valley had a hand in the long struggle to secure the route over the mountains. Marked increase in tourist travel over this pass more than justified the efforts put into this project, which is the last link of the U. S. Highway No. 6 transcontinental system in the State of Nevada. It was pointed out that this route is the only transcontinental highway carrying the same route number for the entire distance. With the completion of this link, the present transcontinental traffic is expected to increase still more.

The improvements recently completed within Nevada have resulted in a highway comparable to the present day standards and permitting a high degree of speed, safety and comfortable travel to the public.

MORE IMPROVEMENTS PLANNED

California is soon to make many improvements between the state line and Bishop in the way of reducing curvature, widening of travelable way, and the betterment of several dangerous railroad crossings.

State Controller Henry Schmidt severed the gold and silver ribbon which was held by two queens, Miss Dorothy Nell Birdsong from Lone Pine, the gold queen representing California, and Miss Isabel Naismith from Tonopah, the silver queen representing Nevada.

After the ceremonies many of the participants enjoyed picnicking at various scenic spots along the pass.

Two Units of New Sepulveda Highway Yet to be Improved

(Continued from page 18)

nando Valley greets the eye; one descends then along the north slope of the Santa Monica Mountains to meet Ventura Boulevard at the community of Sherman Oaks.

Upon the completion of two and one-tenth miles of new road and the improvement of three and three-tenths miles of existing traveled way, the entire Sepulveda Highway will be open as a unit. Finances have been provided out of the 1935–37 state highway budget for the grading, paving and completion of these final short, connecting links, making Sepulveda Highway the new gateway and shortcut route between San Fernando Valley and the sea, and a major travel artery linking main coast and inland thoroughfares and serving to bypass future through traffic around the more congested metropolitan areas.

CALIFORNIA ROAD SYSTEM

Development of California's highway system during the last three decades is revealed in an interesting survey published recently in California Highways and Public Works, publication of the Department of Public Works. * * *

It goes without saying that it is a system of which every California resident may well be proud, in the realization that it comprises one of the State's greatest economic assets.—*Eureka Standard.*

Highway Bids and Awards

for October, 1935

ALAMEDA COUNTY—U. Gr. Xing of Peralta, Adeline Sts. & San Pablo Ave. in Oakland and Emeryville. Rein. conc. rig, fr. U. P. strs, & ret. wall apprs. & paved street connections. District IV, Route 5, Section Oak Emv. Union Paving Co., San Francisco, $419,012; Clinton Construction Co., San Francisco, $382,300; Eaton Smith, San Francisco, $429,936; Bates & Rogers Construction Co., Oakland, $379,790; Bodenhamer Construction Co., Oakland, $449,390; Peninsula Paving Company, San Francisco, $439,905; Lindgren and Swinerton, Inc., San Francisco, $385,318; Macdonald Kahn Co., Ltd., San Francisco, $406,463; Barrett & Hilp, San Francisco, $399,786. Contract awarded to J. F. Knapp, Oakland, $359,932.

ALAMEDA COUNTY—Furnish and apply crusher run base and liquid asphalt surface between Scotts Corner and Arroyo Del Valle Bridge, about 2 miles. District IV, Route 108, Section A. Jones and King, Hayward, $11,696; J. A. Casson, Hayward, $10,560; Heafey-Moore Co., Oakland, $11,217; Lee J. Immel, Berkeley, $11,416. Contract awarded to Independent Construction Co., Ltd., of Oakland, $10,128.

ALAMEDA COUNTY—Between the foot of Folger Ave., and Gilman Street in Berkeley. About 2 miles to be graded by dredging. District IV, Route 69, Section Ber. San Francisco Bridge Co., San Francisco, $203,430. Contract awarded to American Dredging Co., San Francisco, $172,313.30.

ALAMEDA COUNTY—Planing existing asphalt concrete pavement between easterly boundary and Greenville, about 4.6 miles. District IV, Route 5, Section A. Asphalt Pavement Planing Co., Oakland, $3,125; A. Teichert & Son, Inc., Sacramento, $2,500. Contract awarded to Ransome Co., Emeryville, $2,250.

IMPERIAL COUNTY—Between E. Highline Canal and Midway Wells, about 12.5 miles to be graded and surfaced with pl. mix, surf. (Med. curing type). V. R. Dennis Constr. Co., San Diego, $165,573; Oswald Bros., Los Angeles, $167,990; Mundo Engr. Co., Los Angeles, $170,318; Daley Corp., San Diego, $177,706; Gibbons & Reed Co., Burbank, $177,852; Sharp & Fellows Const. Co., Los Angeles, $194,817; J. A. Casson, Hayward, $195,611; Griffith Co., Los Angeles, $221,239. Contract awarded to R. E. Hazard & Sons, San Diego, $151,293.50.

KINGS COUNTY—Between Hanford and 1½ miles easterly. About 1½ miles to be graded and paved with A. C. District VI, Route 10, Section A. Union Paving Co., San Francisco, $45,592; Stewart & Nuss, Inc., & John Jurkovich, Fresno, $52,685; Basich Brothers, Torrance, $51,961; Hanrahan-Wilcox Corporation, San Francisco, $49,597. Contract awarded to Southern California Roads Company, Los Angeles, $43,404.25.

LASSEN COUNTY—Between Litchfield and 5.3 miles Easterly, about 5.3 miles in length, to be graded. Dist. II, Route 73, Section B. Hemstreet & Bell, Marysville, $14,960; Claude C. Wood, Stockton, $14,995; Harms Bros., Sacramento, $16,805. Contract awarded to Isbell Construction Co., Reno, Nevada, $14,275.

LOS ANGELES COUNTY—Between Mabel Street and Atlantic Blvd., about 0.6 mile P. C. C. curb and gutter to be constructed mix. surf. to be placed on adjacent shoulders. Dist. VII, Route 26, Section D. Oswald Bros., Los Angeles, $7,232; J. L. McClain, Los Angeles, $6,392. Contract awarded to Paul P. Hughes, Long Beach, $5,851.

LOS ANGELES COUNTY—Between Verdugo Road and Flintridge Country Club; 1.5 mile, Grade and A. C. Pave. District VIII, Route 9, Section B. C. O. Sparks, Los Angeles, $120,198; Griffith Co., Los Angeles, $124,021; Oswald Bros., Los Angeles, $128,499; F. L. McClain, Los Angeles, $128,597; Gibbons & Read Co., Burbank, $139,571; P. J.Akmadzich, Los Angeles, $140,098. Contract awarded to Geo. R. Curtis Paving Co., Los Angeles, $116,452.15.

LOS ANGELES COUNTY—San Fernando Road through Newhall, between Railroad Ave. and Placerita Road, 0.8 mile, asphalt concrete pavement. District VII, Route 23, Section H. Griffith Company, Los Angeles, $35,582; Oswald Bros., Los Angeles, $28,740. Contract awarded to George R. Curtis Paving Co., Los Angeles, $24,504.10.

MONTEREY COUNTY—King City to 2 miles south of Greenfield, 8.7 miles seal coat to be applied. District V, Route 2, Sections E, F. Granite Constr. Co., Ltd., Watsonville, $6,443; Oilfields Trucking Co., Bakersfield, $8,215; L. A. Brisco, Arroyo Grande, $6,834; Ernest L. Yaeger, San Bernardino, $7,412. Contract awarded to Pacific Truck Service, Inc., San Jose, $6,412.50.

RIVERSIDE COUNTY—On Iowa Avenue between East Eighth Street near Riverside and La Cadena Drive, about three (3.0) miles in length, shoulders to be treated with liquid asphalt (SC-2). Dist. VIII, Route 43, Section C. Square Oil Company, Los Angeles, $1,821; Paulsen & March, Inc., Los Angeles, $1,769; Morgan Bros., Huntington Park, $1,786; Gilmore Oil Co., Los Angeles, $1,790. Contract awarded to Lambs Transfer Co., Long Beach, $1,692.

SACRAMENTO-YOLO COUNTIES—Between M Street subway and M Street Bridge, and between Ben Ali subway and Ben Ali station; 1.2 miles; water supply system, irrigation system, concrete curbs and gutters, and grading portions of roadway. District III, Routes 6 and 3, Sections C and B. A Teichert & Son, Sacramento, $17,665; J. R. Reeves, Sacramento, $19,073; Robt. B. McNair, Oakland, $19,924. Contract awarded to L. C. Seidel, Oakland, $16,753.40.

SAN BENITO COUNTY—Between Lonoak and San Benito about 17.8 miles to be treated with liquid asphalt. District V, Route 119, Section B. Gilmore Oil Co., Los Angeles, $5,490; Lamb Transfer Co., Long Beach, $6,870; Pacific Truck Service, Inc., San Jose, $6,705; Tiffany Constr. Co., San Jose, $7,750; Oilfields Trucking Co., Bakersfield, $6,625. Contract awarded to L. A. Brisco, Arroyo Grande, $4,985.

SAN BERNARDINO COUNTY—Between Klinefelter and easterly county boundary about 15 miles in length, liquid asphalt to be furnished and applied. District VIII, Route 146, Sections E & F. Paulsen & March, Inc., Los Angeles, $1,440; Morgan Bros., Huntington Park, $1,249; Oilfields Trucking Co., Los Angeles, $1,797; Gilmore Oil Co., Los Angeles, $1,417; Lambs Transfer Co., Long Beach, $1,320. Contract awarded to Square Oil Co., Los Angeles, $1,224.

SAN BERNARDINO COUNTY—In San Bernardino County between Camp Angelus and So. Fork Santa Ana River, about ten and one-half (10.5) miles to be treated with liquid asphalt. District VIII, Route 190, Section F. Gilmore Oil Company, Los Angeles, $4,621; Paulson & March, Inc., Los Angeles, $4,455; Morgan Bros., Huntington Park, $4,720; Lamb Transfer Co., Long Beach, $4,405. Contract awarded to Square Oil Co., Los Angeles, $3,825.

SAN BERNARDINO COUNTY—Between east city limit of Redlands and Calimesa, about 4.8 miles in length, shoulders to be treated with liquid asphalt (SC-2). District VIII, Route 26, Section E. Paulsen & March, Inc., Los Angeles, $1,210; Morgan Bros., Huntington Park, $1,178; Square Oil Co., Los Angeles, $1,240; Gilmore Oil Co., Los Angeles, $1,298. Contract awarded to Lambs Transfer Co., Long Beach, $1,168.70.

SANTA CLARA COUNTY—Between Sunnyvale and Saratoga, grade and surface with creek gravel base about 0.23 miles. District IV, Route 114, Section A. Lee J. Immel, Berkeley, $8,976; A. J. Raisch, San Jose, $8,859; Pacific Truck Service, Inc., San Jose, $8,394; John Jurkovich, Fresno, $9,905; Tiffany Constr. Co., San Jose, $9,304. Contract awarded to Earl W. Heple, San Jose, $8,001.50.

SIERRA COUNTY—Furnish and stockpile surfacing material at Downieville. District III, Route 25, Sec-

(Continued on page 32)

Trucks Must Display Night Warning Lights

Changes in the Motor Vehicle Code, relating to warning signals that must be displayed by trucks and tow cars, which became effective September 15, 1935, read as follows:

Flares—Section 590. Every truck or commercial vehicle operated on any highway outside the corporate limits of any city or town shall be equipped with and at all times carry at least two flares or two red lanterns or two warning lights or reflectors which shall be placed on the highway displayed continuously during the hours of dark- at a distance of 200 feet to the rear and 200 feet to the front of such commercial vehicle when it is disabled on the highway, and which shall be ness while such vehicle remains disabled on the highway. Approval of flares is not required, but the reflectors used for the purpose must be of approved types as prescribed by the Department.

Warning Signals—Tow Cars—Section 586.5. The operator of a motor vehicle used for the purpose of rendering assistance to other vehicles shall, when the rendering of assistance necessitates the obstruction of any portion of the highway, place warning signals on the highway which will be visible both day and night. Such signals shall be of a uniform type described by the Department.

HIGHWAY CREW FIGHT FIRE IN MALIBU HILLS

(Continued from page 26)

stayed to protect their property are entitled to a great deal of praise. I personally know what they had to endure and the risk they ran because Apperson and myself investigated the fire as it was approaching the school and knew that it would be very severe.

"We tried to induce these people to come out and offered to haul their furniture and belongings on our trucks, but they declined, feeling they could save their places if they remained with our crew."

PRAISED BY SUPERIOR

In his report to Director Kelly, forwarding Superintendent Gallagher's account of the Decker Canyon fire fighting, District Engineer Scott said:

"In rendering services to the residents of the Decker Canyon Settlement at such a time, when without aid they would have lost their homes and perhaps the lives of some of their dear ones, the employees of the State Division of Highways have done a fine piece of work and have received many words of praise."

Teacher: "My goodness, Willie! How did you get such dirty hands?"

Willie: "Washin' my face."—*Atlanta Constitution.*

Truss Sections Moved Ahead on Rollers

(Continued from page 28)

the centering. After the concrete was poured and had obtained sufficient strength, the wedges were removed and the truss section allowed to rest on rollers.

FALSEWORK MOVED AHEAD

By means of jacks this section was moved ahead and again raised to the required elevation by wedges, the entire operation taking about eight hours. Under the temporary trestle of the Pacific Electric this method could not be used as the piling penetrated through the deck and this falsework had to be constructed in place.

Back fill of the tunnel arch is progressing at the rate of 300 cubic yards per day and it is expected that the intersection of Ocean and Colorado Avenues will be ready for pavement by the first of December.

Much of the paving and sidewalking on Ocean Avenue is to be done by the city of Santa Monica. The suspension of the SERA has delayed this work and it is hoped that the work can be reinstated under the WPA in time to open the intersection of Colorado and Ocean Avenues by Christmas.

HIGHWAY BIDS AND AWARDS FOR THE MONTH OF OCTOBER

(Continued from page 31)

tion A. Contract awarded to Beerman & Jones, Stockton, $4,095.

SIERRA COUNTY—At Downieville, 0.12 miles to be graded. District III, Route 25, Section A. Contract awarded to Charles Kuppinger, Lakeport, $16,943.90.

SOLANO COUNTY—Between 3.7 miles north of Fairfield and 0.6 miles south of Vacaville, 3.8 miles. Grade and surface with A. C. or P. C. C. District X, Route 7, Section C. M. M. Ball Sons, Berkeley, $182,728; A. G. Raisch, San Francisco, $204,989; Fredrickson Watson Construction Co., Frederickson Bros., Jones & King, Oakland, $191,152; Hanrahan Wilcox Corporation, San Francisco, $184,918; Peninsula Paving Company, San Francisco, $195,728; A. Teichert & Son, Inc., Sacramento, $194,199. Contract awarded to Union Paving Co., San Francisco, Alt. "A," $178,696.10.

STATE HIGHWAY MAPS MADE AVAILABLE TO MOTOR PATROL

Officers of California Highway Patrol today have complete and detailed knowledge of every highway and byway in the State, regardless of whether or not it is under their jurisdiction.

This great store of road information was made possible for the patrol by cooperation of Earl Lee Kelly, Director of Public Works, in presenting department of motor vehicles with bound maps for each police squad room in the State.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

HARRY A. HOPKINS, Chairman, Taft
TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
CHARLES D. HAMILTON, Banning
RAY INGELS, Ukiah
C. H. PURCELL, State Highway Engineer, Sacramento
JULIEN D. ROUSSEL, Secretary

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

J. W. VICKREY, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego

General Headquarters, Public Works Building, Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
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MAP
SHOWING
STATE HIGHWAY SYSTEM

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CALIFORNIA

HIGHWAYS AND PUBLIC WORKS

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New Tower Bridge at Foot of "M" Street
Sacramento

Official Journal of the Department of Public Works

DECEMBER 1935

Seattle Public Library

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Seattle Public Library

8,000,000 Man Hours Work

Provided for Californians this Winter

On 99 Highway Projects

Put Under Way During Past Month

By **EARL LEE KELLY,** Director of Public Works

THE past month has seen the accomplishment of the largest task ever undertaken by the Division of Highways in putting under way in California the two Federal relief programs designed to provide employment through highway construction and improvement.

From the Federal Emergency Relief funds authorized by Congress, allocations to California under the WPA for these two programs amounted to approximately $15,234,300, of which $7,747,900 was for U. S. Works Program Highway projects and $7,486,400 for U. S. Works Program Grade Separation projects.

Required approval by the various Federal agencies of the projects included in these two programs was obtained about the first of October. At this time, the Division of Highways set about immediate preparation of plans and specifications of approved projects prior to the publishing of advertisements calling for bids.

Through the sustained and loyal efforts of the entire State highway organization, the work of advancing projects has progressed so rapidly, that since November 1, 99 construction projects estimated to cost about $13,561,800 have been awarded, are now pending award or are advertised for bids.

EARL LEE KELLY

These 99 projects include 45 U. S. Works Program Highway projects, 35 U. S. Works Program Grade Separation projects and 19 projects from the regular budget of the Division of Highways for the current biennium.

It is estimated that the 45 Federal relief highway projects will provide employment to the extent of 3,402,000 man hours, the 35 grade separation projects will provide 3,085,000 man hours, and the 19 projects being financed under the regular State highway budget will provide 1,504,000 additional man hours making a total of nearly eight million man hours of work just opening for California labor. Were this figure reduced to jobs of an average of six months duration, it would mean work for over 9,000 men for that period.

Never before in the history of highway construction in California has such a volume of work been placed under way within so short a space of time.

EMPLOYMENT FOR THOUSANDS

With this construction drive under way, it is anticipated that the unemployment relief rolls of most of California's counties will be reduced to a minimum and the coming months will see the return of a degree of

(Continued on page 12)

Relocation of Half Moon Bay Highway Reduces Grades, Curves and Distance

By **A. W. McCURDY,** District Office Engineer

HUNDREDS of years ago, the Indians of the valley now called the Santa Clara Valley trekked through a low saddle of the Coast Range of mountains to their fishing grounds on the Pacific Ocean.

Later, the padres, after establishing their churches in the towns of San Jose, San Mateo and San Francisco, cut across by way of the Indian trails to the west, and established still another church in a fertile little valley overlooking the mighty waters of the ocean. This town was then known as Spanish Town, but was later named Half Moon Bay, after the shape of the beautiful bay upon which it looks.

The trail proved a popular one, gradually assuming importance both for transportation of crops which grew so luxuriantly in the Half Moon Bay Valley, and as a short cut to the bay where small vessels could approach close to the shore.

But in those days no thought was taken of the future, and the automobile had not even been dreamed of; so the easiest passage was adopted, and the trail from the saddle of the mountains westerly followed the northerly side of the Pilarcitas Creek Canyon.

This side of the canyon was cut up by a number of deep and long gorges, but allowed a quick drop to the head of the valley, and being on the sunny side, was dryer and warmer for travel. The result was that almost the entire climb from the valley was compressed into less than one-half of the distance.

So steep was the hill section of the old road that when the stage from Half Moon Bay arrived at the foot of the hill, the able-bodied passengers were invited to get off and walk for about one-third of a mile across the north branch of the Pilarcitas Creek and up the steep hillside to meet the stage again after it had slowly traveled almost two miles around the various gulches, thus giving the horses some relief.

As the demands of traffic increased, the road became an important lateral between the El Camino Real, Skyline Boulevard and the highway adjacent to the ocean, and was improved by local authorities as far as possible. On account of the roughness of the easterly section adjacent to the saddle, it was soon found that in order to obtain good alignment and grades, very expensive highway work was required.

San Mateo County then paved this section from Half Moon Bay to the foot of the hill with portland cement concrete, but left the remainder as a macadam road until finances would allow improvement.

During the year 1933 the legislature incorporated into the State Highway System this road from San Mateo to Half Moon Bay. The apportionment of Federal funds for highway work in 1935, together with State Highway funds, provided the desired opportunity

(Continued on page 18)

THROUGH THE HILLS to Half Moon Bay goes the new State highway instead of around the sides of steep gorges on stiff grades. The two upper pictures show the new highway and glimpses of the old line. At bottom is a view of the winding dangerous old road of many curves.

State Snow Fighters Will Keep Open 4,000 Miles of Highway in 42 Counties

By **T. H. DENNIS**, State Maintenance Engineer

DURING a normal winter season in California, snow is removed on 3,000 miles of state highways. This mileage is distributed over forty-two of the state's fifty-eight counties. Unusual storms may, however, expand this mileage to 4,000 miles, and leave in their wake some 11,000,000 cubic yards of snow which must be removed without interrupting the traffic. It is apparent that such general distribution and magnitude of snowfall requires efficient organized effort for its removal and the Division of Highways is prepared to do a thorough job this winter.

Snow removal is usually limited to main traffic routes, important interstate connections, and recreational roads, where the traffic developed justifies the added expense.

T. H. DENNIS

TRAFFIC CONTROL MEASURES

Snow removal work carries with it a very definite responsibility for the proper protection of traffic. It is the view of those in charge that if an open road is advertised, it must be as safe as conditions will permit. With this in mind, arrangements are made for the placing of hazardous sections of road under control. This phase of the work is handled in cooperation with the California Highway Patrol.

Whenever there are icy conditions, motorists are not permitted to enter the control area unless the vehicles are equipped with skid chains. Likewise, during periods when snow is falling heavily or there is a strong wind, with consequent low visibility and danger of temporary blockade, traffic is held up entirely until conditions are favorable for safe passage.

This control is a part of the routine work on the Donner Summit section of U. S. 40 and between Bishop and Bridgeport on State Route 23. Controls are placed in operation at other points as the need arises.

One of the greatest problems in recreational areas where snow sports are held is the lack of parking space. As a result, when sudden storms occur, snow equipment is often blocked by locked cars parked along the roadway. This condition might easily jeopardize the safety of all motorists using this particular road. It is our feeling that providing this parking space is the distinct problem of those promoting such snow sports; and their responsibility is indeed a real one.

Snow removal is effectively reduced at certain sections by central measures. In many cases, during construction it is possible to raise the grade of the road so that the fill portions will be kept clear by wind action. Likewise, the ditch section is widened and the slopes flattened in cuts to provide storage space for the snow. In other areas, clearing of brush and trimming lower branches of trees will reduce the eddying action of the wind and consequently lessen the deposit of snow at such points.

SNOW FENCE EFFECTIVE

In open areas, snow fence made of lath pickets is installed on the windward side at sufficient distance from the road to insure formation of the drift at the desired point off the road. In some cases, planting of trees and shrubbery serves the same purpose, At the present time the state has some twenty miles of snow fence in place.

Efforts toward ice prevention and removal are confined principally to sanding frosty or icy sections of pavement to insure traction for motor vehicles. Sand mixed with salt, in the proportion of about one hundred pounds of salt to each cubic yard, is stock-piled in shelters at convenient locations prior to the winter season. During the present season $20,000 has been allotted for this purpose.

(Continued on page 22)

Seattle Public Library

SNOW REMOVAL EQUIPMENT keeping California State highways open this winter numbers 168 units of various types some of which are pictured above. At top, a tractor type rotary, the business end consisting of a V-plow with a rotary on each side. Below, right, are speed type and tractor push plows. At left, a large V-type push plow and at bottom an auger blower type rotary.

Charter Way Grade Separation in Stockton a $400,000 W.P.A. Project

THE SECOND largest project in the extensive program of thirty-nine grade separations being put under way by the Division of Highways throughout California with Federal and State funds is the Charter Way underpass in Stockton for which bids were opened December 10th in Sacramento.

This project provides for the separation of the street grade and the grades of the Western Pacific and Southern Pacific Railroads where the latter cross State Route No. 5 which is the main highway arterial from Oakland and the Bay region via Hayward, Livermore and Dublin Canyon into the city of Stockton.

The estimated construction cost of the project for which Federal WPA funds are available is $400,000. Purchase of necessary rights of way involve an additional estimated $80,000 for which Director Earl Lee Kelly of the Department of Public Works has approved an allocation of $68,500 from gas tax funds apportioned for expenditure upon State highways within cities. The city of Stockton is providing the remaining $11,500.

$160,000 DIRECTLY TO LABOR

According to the engineers, construction of the project will afford employment to approximately forty men for a period of nine months. This figure is given for unskilled labor only and does not include employment under the classification of skilled labor. As the funds to be used for construction are Federal funds of the Federal Emergency Relief Appropriation Act of 1935, it is understood that approximately 80 per cent of the labor will be obtained from the local Federal employment bureau.

Director Kelly's office has calculated that about forty per cent or approximately $160,000 of the project's cost will be paid directly to labor. It is expected that construction of the project will relieve the local relief roll as preference will be given to persons on the roll for employment.

Plans for the subway, considered one of the major improvements being undertaken by the State to eliminate grade crossings, were prepared in cooperation with City Engineer Lyle Payton. The plans show the structure will be similar in general design to the existing Miner Avenue underpass beneath the same railroads but a most prominent variation will be apparent in the roadway dimensions.

FOUR TRAFFIC LANES

Four lanes of traffic will be accommodated by a roadway forty-seven feet wide, divided along the center by a concrete curb three feet wide. Like the Miner Avenue Subway, the structure will be uncovered where passing directly below the railroad tracks.

Drainage of storm waters is given full attention by the inclusion of a large sump to be relieved by a pumping plant which will automatically discharge to a predetermined level and will maintain the roadway free of ponded water.

The underpass proper is designed to extend from the west property line of Pilgrim Street to the east property line of Aurora Street, a length of approximately 1,072.5 feet. The entire improvement, including the street level approaches, will extend from a point opposite Sharps Lane to a point approximately 230 feet west of Aurora Street, and will occupy a right of way 110 feet wide.

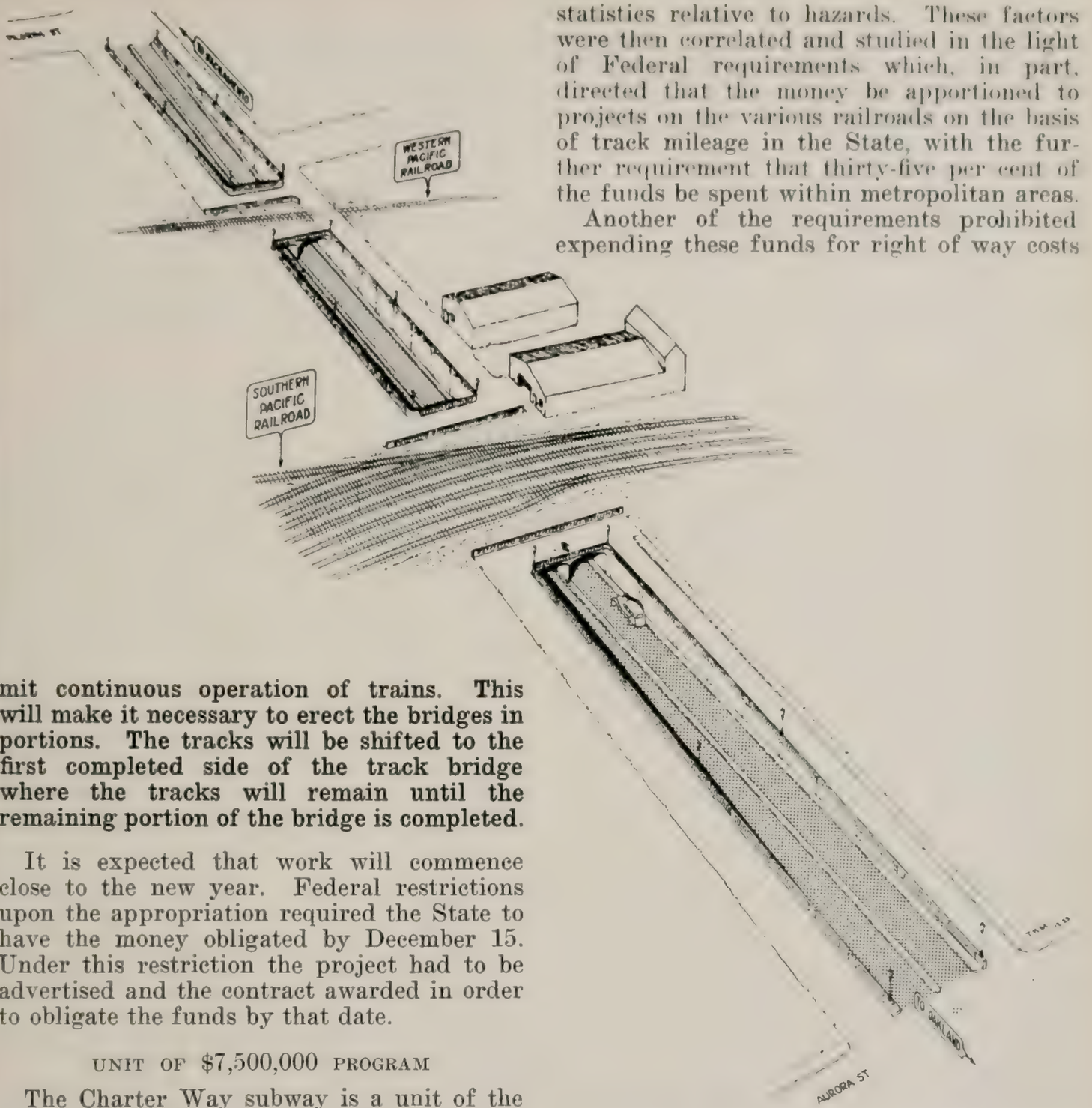
An additional fifty-five feet of right of way was required in order to provide ground level streets paralleling the structure on each side. These streets will be graded and paved to a width of twenty-five feet to provide a passage to adjacent properties.

Vehicular bridges will be constructed on a level with the streets for crossing the subway at three locations.

NO INTERRUPTION OF TRAINS

In order to provide the parallel ground level streets, it was necessary to shift the structure north to where the longitudinal center line will be contiguous with the north curb line of Charter Way. This shift compelled a transition and deflection in the roadway and widths between the present street and the subway lanes.

The railroad bridges over the underpass will be constructed in two operations to per-



CHARTER WAY undergrade structure through which highway will pass beneath two railroads.

mit continuous operation of trains. This will make it necessary to erect the bridges in portions. The tracks will be shifted to the first completed side of the track bridge where the tracks will remain until the remaining portion of the bridge is completed.

It is expected that work will commence close to the new year. Federal restrictions upon the appropriation required the State to have the money obligated by December 15. Under this restriction the project had to be advertised and the contract awarded in order to obligate the funds by that date.

UNIT OF $7,500,000 PROGRAM

The Charter Way subway is a unit of the most ambitious program of railroad crossing eliminations ever undertaken in the Nation and in the State. Embracing the elimination of thirty-nine grade crossings in California, it is estimated that an expenditure of approximately $7,500,000 will be involved.

In order to meet the restrictions imposed by the Federal Government upon the expenditure of these funds, the California Highway Commission was confronted with the task of selecting a program of projects that would qualify for Federal approval. From a Statewide survey of all crossings both on and off the State highway system, hundreds of locations were studied by engineers of the Division of Highways.

The studies considered physical conditions at the location, traffic conditions and vital statistics relative to hazards. These factors were then correlated and studied in the light of Federal requirements which, in part, directed that the money be apportioned to projects on the various railroads on the basis of track mileage in the State, with the further requirement that thirty-five per cent of the funds be spent within metropolitan areas.

Another of the requirements prohibited expending these funds for right of way costs and property damage. As the State's funds for highway construction have been seriously depressed in recent years, this restriction compelled the State to place the obligation of acquiring the necessary right of way upon the municipalities when the project was located within the corporate limits of a city.

Generally, such costs are considerable in metropolitan and developed areas, placing the project beyond the community's resources. In many locations the State found it necessary to abandon worthy and much-needed projects because of this condition.

A bird at the wheel is worth two in the ambulance.

Transportation Must Look Forward in Spirit of Cooperation, Says MacDonald

In a recent radio broadcast under the auspices of the National Municipal League, Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads, discussing the topic "A National System of Transportation," said there can be no cessation of transportation progress and the industry must look forward in an increasing spirit of cooperation to new developments including a master national highway plan for which surveys are under way in the various states.

By **THOMAS H. MACDONALD,** Chief of U. S. Bureau of Public Roads

A FRIENDLY but keen observer from another country, who was making a critical examination of one of our major industries, at a dinner tendered him on the eve of his departure, made what seems to me a very intelligent comment. In this particular line he is outstanding, and the whole purpose of his trip had been to advance the competitive position of himself, his associates, and his country by gaining worth while information. When his turn came to speak he said:

"After a most interesting experience, in which I have been taken up into the high places by my friends of this industry, I am left with a warm feeling of appreciation for your many courtesies, and a profound respect for your accomplishments; but in a purely friendly way, while I would not go so far as to say that I see the handwriting on the wall, I must in all honesty say I do see the wall upon which it is possible to write."

With so big a subject a very large wall would not suffice for even a small portion in any detail. With so profound a subject, one must needs forget too much of the past to suggest any straight and narrow path which we are to follow in the future. No handwriting on the wall, nor the remembering of such a ponderous title, makes me forget the story of transportation.

Not all the heavy dissertations of experts quoting experts can paint out the picture shining through, of the hazards dared and the romance lived in transportation achievement which vividly outlines the past. The clipper ships, the pony express, the Conestoga wagons, the National Pike, the Oregon Trail, and overlying these the gasoline buggy, the streamlined train, air service to the Orient—all the fascinating story of the daring, pioneering, individualistic progress in transportation which is the heritage of this country itself, in comparison with the old world is relatively new.

Don't Be Silly

"It is silly to make plans for the future predicated upon current transportation requirements or upon any assumption that existing facilities must be preserved. The story of transportation is a repetition of replacing old facilities and forms with new."

—Thomas H. MacDonald

So in talking of planning, I wish modestly to speak of certain trends without intending to intimate, and certainly without believing, that there will be a stop to transportation progress. Neither is there any confidence in the willingness of the public to regiment transportation in the sense of undesirable or drastic governmental control. Nothing with the strength of achievement that has been written into the development of transportation in this country can be so controlled that it becomes static. Like measles it breaks out in many places.

PRODUCT OF DEPRESSION

Nearly everyone speaks of coordination of transportation as the solution of our transportation troubles. Findings are made by many bodies that we are overstocked with transportation facilities. Such a conclusion is the product of the depression, and it should be pointed out that we find ourselves over-

Supply and Demand Yardstick Suggested for Transportation

(Continued from preceding page)

stocked with everything except employment. It is silly to make plans for the future predicated upon current transportation requirements or upon any assumption that existing facilities must be preserved. The story of transportation is a repetition of replacing old facilities and forms with new.

Curtailment is being urged now with the same enthusiasm that enlarged facilities will be urged as business gets back to a more normal tempo. Economists recognize two great fundaments—supply and demand. Why transportation in a country three thousand miles long and one thousand miles wide is not given greater weight is to me incomprehensible.

It is not sufficient to plan the future upon the basis of these two factors—supply and demand—without giving major weight to transportation. The depression has made us take stock, and has supplied us with both the motive and the leisure to study our whole transportation system.

CHANGE AND PROGRESS

There is no need to introduce in this short talk controversial questions. Suffice it to say, that much more has been gained than lost by the development of the newer types of air and highway transport which recently have been added to the older types of rail and water. In the aggregate the public is the gainer. So the problem is to fit together the jigsaw puzzle that is the picture *now*, not what *was* the picture some time in the past.

There seems to be a most naive conception of our transportation problem—that by hook or crook we can turn back the pages of time and restore through legislation and regulation the situation as it was at some particular time in the past. Only a casual look around indicates the fallacy of such reasoning, and the most reliable prophet for the future is he who predicts constant change and constant progress.

I have faith in the trend toward a more generous, more intelligent cooperation. Here are two examples—the motor industry has turned its house upside down, has advanced its presentation of new models by three months in the hope of making better conditions for labor. How simple this sounds but what a pioneer advance in cooperation between this industry and labor.

GRADE CROSSING CAMPAIGN

Again, through cooperation between the railways, the state highway departments and the federal government, we are now engaged upon a program that will wipe out of existence more than two thousand of the most dangerous railway crossings in the nation.

If we look critically at our existing major types of transportation, we find the oldest of all, the waterways, restricted in operation to those watercourses which have been developed and are maintained for navigation. Leaving out of consideration seaports, which are of major importance to the transportation facilities of the country, but cannot by any stretch of the imagination be considered competitive, except between themselves, we have inland waterways to the extent of 27,000 miles.

JUST LIVING UP TO THE BEST TRADITIONS OF THE STATE HIGHWAY SERVICE

THE MANOR GARDENS

Office
202 Ballymore Road
Springfield, Penn.

Nov. 25, 1935.

State Highway Department,
Sacramento, California.

Gentlemen:

I want to call your attention to the fine treatment three of us received from two of your state men last summer.

If I recall correctly it was the afternoon of Saturday, July 20, when these two men found our abandoned car in the mountains west of Death Valley, searched until they found two of us in an old shack—the other chap had gone for help, gave us sadly needed water, found the third chap, and brought us in to Darwin.

More courteous men cannot be found in any organization, and I want to congratulate the State Highway Department in having such noble fellows in its force.

Very truly yours,

S. D. GREEN (Signed)

The development of inland waterways may be largely a by-product of stream control. The public attitude toward the control of floods and the checking of soil erosion, indicates the probability that stream control will be extended, and thus inland waterway facilities may be available to the extent they are found to be practicable for transportation uses.

There are approximately 246,000 miles of steam railways in the United States. There has been concern expressed because of some decrease in this mileage. The Bureau of Public Roads has studied every recent abandonment or proposed abandonment and there is no cause for concern. Rather, the future will see a very much larger curtailment of unprofitable rail mileage.

ROAD MILEAGE 3,099,000

There are now American operated air transport routes, classified as domestic, 29,000 miles; foreign, 22,000 miles—a total of 52,000 miles.

In the federal-aid system of highways there are 227,000 miles, but the total public road mileage in the country is 3,099,000 miles.

Each type of transportation is supreme in certain characteristics—each type has its definite handicaps. The only sane motive is to plan transportation based on these favorable and unfavorable characteristics.

The Coordinator of Transportation, Mr. Eastman, has in a short time, under extreme pressure, and without much essential data, produced a remarkable series of sound recommendations upon transportation coordination. The National Resources Committee has been giving attention, among other things, through the state planning boards, to the planning of transportation.

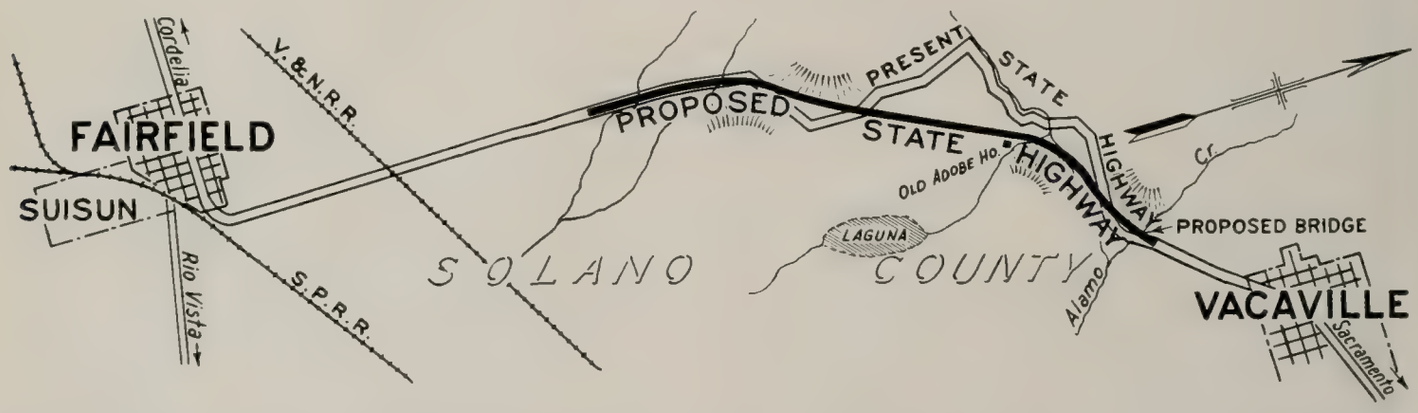
(Continued on page 18)

Vacaville-Fairfield Line Change Will Abolish 17 Curves in Span of 4 Miles

By **R. E. PIERCE,** District Engineer

AFTER a delay of two years due to an injunction and a test case in the courts, occasioned by the "Alternate Bid Act," the so-called "Orchard Line Change" between Vacaville and Fairfield is now under construction.

This change will replace the highway, as built through the orchards south of Vacaville during 1913, which, following closely the old county road, has several miles of poor alignment. This poor alignment was largely due to the reluctance of the county authorities, on whom at that time fell the burden of securing rights of way, to agree to any radical departure from the county road as it then existed.



This stretch of road with its winding curves through the orchards and along wooded stream banks makes a very attractive scenic and recreational drive, but as the bulk of traffic on this important artery between the San Francisco Bay metropolitan area and the Sacramento Valley, a sector of the main transcontinental road leading from the central part of the State, is on business bent or hurrying to arrive at points beyond, this stretch of winding road with restricted sight distance is a serious handicap.

A relocation has been under consideration here for some years, and surveys were made, but much needed work elsewhere deferred this improvement.

During the resurveying of the new location recently, two old buildings were observed, and found, upon inquiry, to have an interesting and romantic history. Though these buildings were only a few hundred feet from the present highway, they were hidden by the orchards and their existence was known to but few.

It was the writer's pleasure to have the opportunity of meeting and talking with Mrs. Maria Dolores Vaca Pena Lyon, a woman in her eighties—born in an adobe in this area—a direct descendant of the Vacas and Penas, owners of a grant of land containing 48,000 acres, and founders of the present town of Vacaville in 1851.

Mrs. Lyon in spite of her age has a very alert, active mind, and her memory seems unimpaired. She informed me that one of the buildings, an adobe (well preserved due to being entirely enclosed in a wooden frame), had been built by Senor Pena, her paternal grandfather, in 1842 and was occupied by the Pena family and descendants for over sixty years.

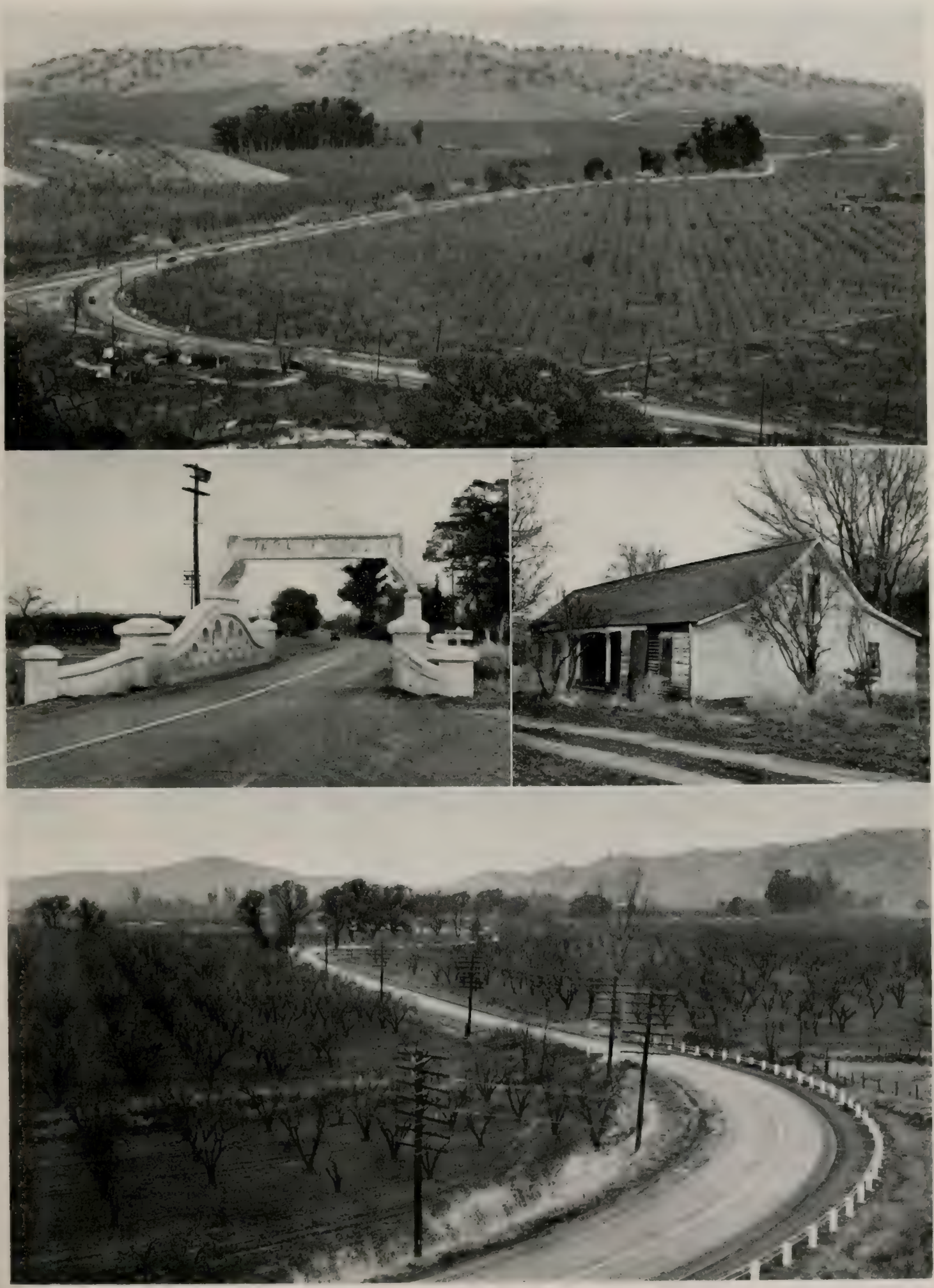
The other building, a wooden structure, was built some time later by her uncle, also a Pena; but is now in ruins and about to be torn down. For many years it was the home of the Buckingham family, some of whom still own and farm adjacent property.

BUILT BY MISSION INDIANS

Mrs. Lyon was born in another adobe built by her maternal grandfather, Senor Vaca, a little east of the one now standing. The latter adobe was constructed by Indian laborers brought from Santa Barbara.

Originally the roof, now shingled, was covered by tiles locally made and formed by shaping over the Indians' thighs. None of these tiles remain. According to Mrs. Lyon,

(Continued on page 17)



WINDING THROUGH ORCHARDS of the old Vaca rancho, the existing highway between Vacaville and Fairfield was built in 1913 and boasts 23 curves in one 4 mile stretch shown in top and bottom views. In center, old Pena adobe built in 1842 and narrow old bridge to be replaced.

$13,561,000 Put to Work in Six Weeks

(Continued from page 1)

prosperity to thousands of California families whose living for the past few years has been of a very precarious nature.

While this unprecedented volume of highway construction is anticipated to do much for the relief of unemployment among California labor, it also will add materially to the improvement and safety of California highways.

The amounts making up the total of $13,561,800 for the 99 construction projects are as follows for each of the three funds:

Works Program Highway Funds	$5,130,800
Works Program Grade Separation Fund	6,084,600
State Highway Fund and Regular Federal Aid	2,346,400
Total	$13,561,800

Under these 99 projects which have been started since November 1, improvements will be made to over 250 miles of road and construction of 37 grade separations and bridges will be accomplished.

A STAGGERING TASK

The accompanying tabulation lists the mileage and amount to be expended for the various types of construction from the three sources of funds under which this large volume of work is to be accomplished.

During the present period when governmental appropriations for relief reach staggering figures, it is difficult to visualize the size of the task involved in plans, specifications and contracts for this form of unemployment relief which has been begun by the Division of Highways.

Monthly reports submitted by the Division of Highways show that the normal number of construction projects placed under way during the first ten months of the year amounted to $11,700,000 in comparison to the $13,500,000 in projects which have been started since November 1, clearly indicating the effort which has been put forward in making immediately available to the citizens of California the Federal relief funds allocated to this State.

The week of December 8th was one of the greatest activity in the opening of bids on the WPA program by the Department of Public Works. On four days of that week proposals were opened for 30 construction projects that were estimated to cost over $4,000,000.

Approximately 150 proposals were submitted for these 30 projects indicating keen competition upon the part of contractors and showing that even with the emergency Federal labor requirements governing the work State highway construction may be carried on by the contract method.

WORK AWARDED, PENDING AWARD AND ADVERTISED NOVEMBER 1 TO DECEMBER 15, 1935

Type	State Highway Fund and Regular Federal Aid		Works Program Highway Projects		Works Program Grade Separation Projects		Totals	
	Miles	Amount	Miles	Amount	Number	Amount	Miles	Amount
Pavement	30	$1,801,000	4.8	$103,200			35.4	$1,904,200
Bituminous Treated Crushed Rock Surface	10.1	248,600	132.1	2,634,400			142.2	2,883,000
Untreated Crushed Rock Surface			2.6	329,500			2.6	329,500
Graded Roadbed	0.6	36,500	72.4	2,063,700			73.0	2,100,200
Bridges and Grade Separations	(2)	202,800			(35)	$6,084,600	(37)	6,287,400
Oil Treatment	1.3	7,900					1.3	7,900
Miscellaneous Contracts		49,600						49,600
Totals		$2,346,400		$5,130,800		$6,084,600		$13,561,800

Johnny—Mother, I'm lonesome. I haven't got anybody to play with.

Mother—Well, go out and play with Dick.

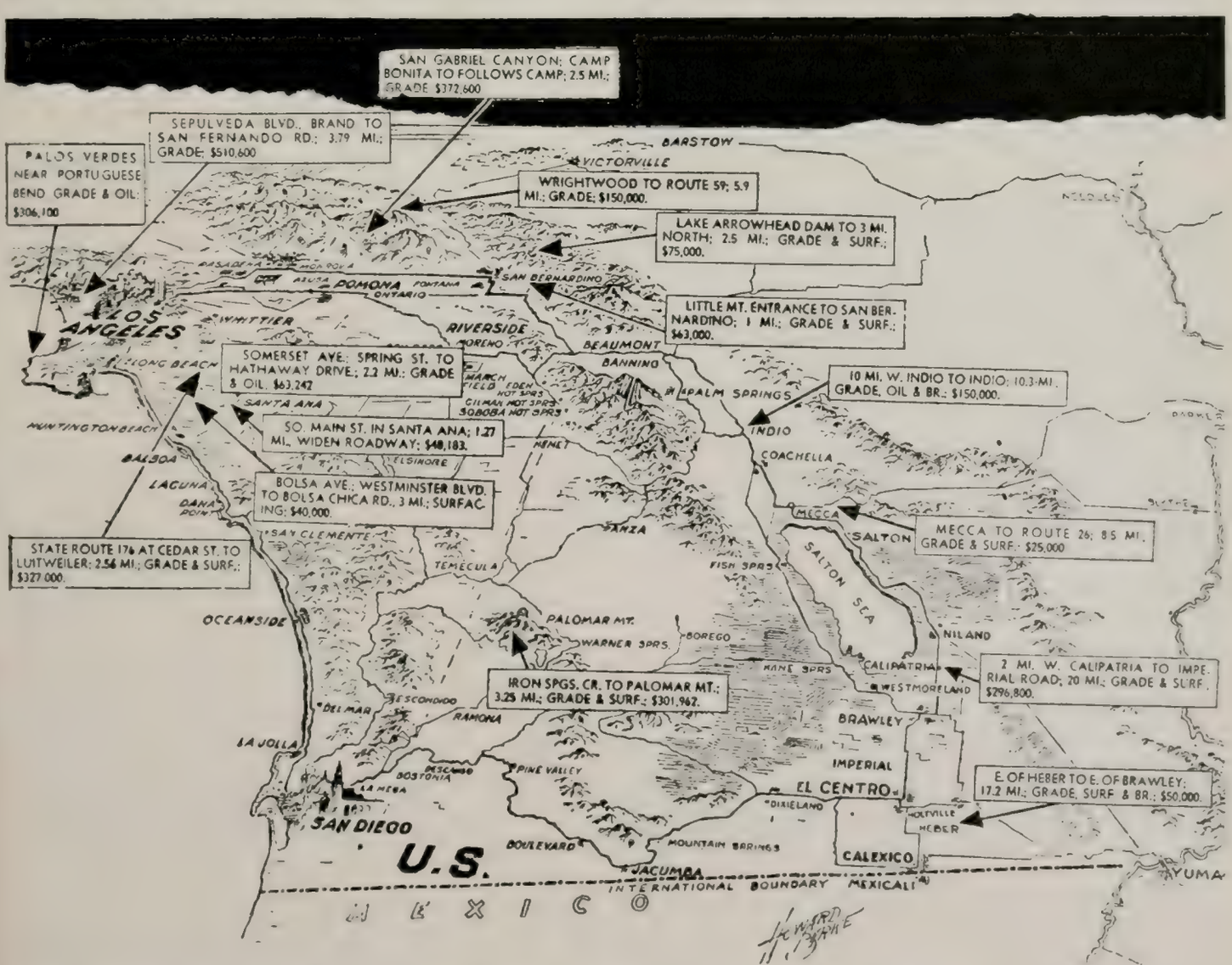
Johnny—Oh, I played with him this morning and I don't believe he'll be well enough to come out yet.

Chris—Now, then hurry up.

Bill—All right, boss. But Rome wasn't built in a day.

Chris—Maybe not. But I wasn't foreman on that job.

MILLION DOLLAR BID DAY at Sacramento headquarters December 10, 1935, when low bids on 9 highway projects totaled $1,366,000. Officials standing, right to left: Assistant Office Engineer Wm. Bock; Acting Bridge Engineer F. W. Panhorst; Senior Highway Engineer J. D. Shaw, U. S. Bureau of Roads. Seated, right to left: Principal Assistant Engineer J. G. Standley; Office Engineer R. H. Wilson and Deputy Director of Public Works E. J. Neron.



SOME SOUTHERN CALIFORNIA PROJECTS in WPA program. Map courtesy Los Angeles Examiner.

Roadside Landscaping Plans for 1936 Include Some Large Planting Projects

By **H. DANA BOWERS**, Landscape Engineer

THE roadside development or landscaping program for 1936, for which plans are now being formulated by the landscape section of the Division of Highways Maintenance Department, will entail an expenditure from federal and state funds of $159,496. Approximately $110,000 will have been spent upon completion of the sixteen roadside landscaping projects comprising the 1935 program.

In addition to these amounts, there is expended yearly some $100,000 for the maintenance of roadside trees and landscaped areas and various other improvement projects. The maintenance of the trees constitutes the major portion of this amount.

This yearly cost of some $260,000 may appear to be a large amount to spend on the appearance alone of our highways but, in 1934, 272,182, or over a quarter million, tourists visited California seeking recreation and new scenes and left a great deal of money in this state. They came because we have excellent roads and because California has something that no other place has to offer—the mammoth redwoods, the Yosemite National Park, the rugged coast line of northern California, the sunny beaches of southern California, the deserts and the mountains—all these and more, distributed over the state from one end to the other.

NOW FEDERAL REQUIREMENT

The attraction of tourist travel alone would justify the expenditure of large sums in order that our roadsides should present a pleasing appearance, but in addition to this factor, the United States Government requires that a certain amount of federal funds allotted for state highway improvements be set aside for roadside beautification.

In the construction of good roads, the scarring of the landscape is sometimes unavoidable and these scars if not softened or obscured produce a discordant note in an otherwise peaceful and pleasing landscape. They are also subject to erosion until Nature lays down a protective blanket of grass and shrubs, which is often a very slow procedure by reason of the difficulty natural seeds find in lodging on the smooth, steep slopes.

Proper treatment of these slopes, depending upon the locality, can save many thousands of dollars in removal of eroded material and slides, which work must be done after each severe rainfall and in many cases increases year after year. With an expanse of territory embracing over fourteen thousand miles, coupled with the semiarid climatic condition of the major portion of the state, it is obvious that a more practical view must be taken of the improvement of roadsides.

APPROPRIATE DEVELOPMENT.

Roadside beautification is, in many cases, erroneously interpreted as meaning the planting of trees and shrubs, grass and flowers. This type of landscaping, which is appropriate for home or park or even many eastern states with their summer rains, is seldom in order along our highways. In order to accommodate the recreational needs of the traveler, advantage must be taken of existing conditions, and the making of improvements that require a minimum of maintenance.

Proper and appropriate roadside landscaping or improvement is often difficult to recognize, and certain areas stand out and attract unfavorable comment only if nothing has been done to blend the road into the surrounding terrain.

A development of intensively landscaped parks and recreational areas demands an expensive and continuous upkeep, the cost of which decreases very little from year to year. More real value will be derived from expenditures on the maintenancee of shade trees in our hot interior valleys, for instance, where many may be benefited, rather than on various developments for appearance only.

These areas should be confined to the centers of population and to the improvement of town and city entrances. Appearances under these conditions, where first impressions are sometimes important, can be valued in dollars and cents by the residents and the city business enterprises. An attractive entrance to any town or city—unfortunately, we have very few—does much to increase good will and improve business conditions

The Division of Highways for some years past has been slowly increasing the organiza-

(Continued on page 28)

ROADSIDE BEAUTIFICATION PROGRESS is shown in these views. At top, tree and shrub plantings embellishing Serra Maintenance Station at highway intersection. Center, ice plant covering slopes on Coast State highway near Ventura. At bottom, a fill slope erosion control project by wattle method interplanted with grains and grasses.

Business of Building Roads that Repay Costs to Taxpayers

THE average motorist gives little thought to the cost or the problems concerning the agency that provides him with smooth, safe highways. He simply figures that it is a natural sequence in the affairs of his State and Nation that good highways are provided. It doesn't occur to him that a most unusual mental and physical effort may have been required to construct a safe, substantial highway through a swamp or mountain section or to provide a great bridge over a long stretch of water or a ravine that will reduce his mileage between two given points and thus save him much wear and tear on his car and tires, besides gasoline consumption.

It has come to a point where those who really study the situation are convinced that the business of building public highways has become a leader in every state in the Union. In the first place, we must have highways that are safe and enduring and they must be built without waste of public funds. And the day of bottle-neck one-way bridges has passed. Motorists are demanding bridges that are as wide as the highways they serve.

CONSTRUCTION URGED

Safety construction such as under-passes and over-passes at highway and railroad crossings is urged upon the state road departments and sometimes folks forget that there is a limit to funds available to these departments for all construction work throughout the states and insist upon the impossible.

No one has yet figured out a method of building good highways and bridges without funds. Successful performance simply can't be had under such circumstances. All gas tax and license tag fees should be devoted to road and bridge construction and maintenance.

PAY DOUBLE TAX

Taxpayers, who are always motorists, frequently forget this truism and thoughtlessly support a movement to divert gas tax to other governmental purposes. In some cases this makes the motorist pay a double tax—one for the privilege of owning and operating a car on the public highways and again when some of the gas tax and license tag fees that he pays are applied to governmental service for which he also pays personal property or real estate taxes. All this isn't so hot for the motorist, but he looks to the representatives in the State legislature to put a stop to it and many of them, in sincere approval, do what they can as individual law-makers.

Finally this question will be effectively disposed of by State and Federal laws, but in the meantime, it is a serious factor in holding back highway construction where it is most needed.—*Florida Public Works.*

PROMPT RESTORATION OF BOX CANYON HIGHWAY WINS COMMENDATION

THE METROPOLITAN WATER DISTRICT
of Southern California
306 West Third Street
Los Angeles, California

Nov. 14, 1935.

Mr. S. V. Cortelyou,
Division of Highways,
808 State Building,
Los Angeles, California.

Dear Sir:

I wish to commend the officials and engineers of the State Division of Highways for the prompt and diligent manner in which they carried forward the repairing of the 7½-mile section of highway east of Mecca. This road was seriously damaged by a cloudburst on August 22, and thereby made impassable for heavy traffic. The closing of this road worked a considerable inconvenience to the Metropolitan Water District because of the fact that it gives access to portions of the aqueduct construction operations between Mecca and Shaver's Summit.

The district was advised that the damaged highway had been repaired and was opened for traffic on October 7.

Very truly yours,
F. E. WEYMOUTH,
General Manager and Chief Engineer,
The Metropolitan Water District
of Southern California.

CALIFORNIA HOLDS SECOND PLACE IN USE OF GASOLINE

With gasoline consumption in the United States up 3.95 per cent, or 305,942,000 gallons, during the first six months of this year, California continued to hold second place on a total of 685,611,000 gallons against 675,626,000 in the first six months of last year, according to nationwide figures. New York retained first place with 723,640,000 gallons, compared with 718,270,000 in the first half of 1934.

New Highway Route Passes Close to Old Vaca Family Adobe

(Continued from page 10)

they were replaced by shingles, as the people then considered shingles much more modern and "classy." The walls are more than 2 feet thick, and the building originally contained more than the three rooms that now remain. It is the only adobe still standing in this region.

Mrs. Lyon's husband, born in Sonoma in 1848, passed away in 1926. His parents were members of the ill-fated Donner party, which was snowbound east of the Sierra Nevadas in the winter of 1846–47.

SOLD TOWNSITE FOR $3,000

The valley in which these buildings are located is known as Laguna Valley, because of a small, shallow lake lying a short distance south and east of the old adobe.

The Vacas and Penas were the first Europeans in this region, having come here in 1832. The grant to them was made in 1842–46. The town of Vacaville was started in 1851 when Manuel Caleza de Vaca deeded to William McDaniels nine square miles of the grant for a consideration of $3,000 and a town site, one square mile named Vacaville, and 200 town lots in 1856.

To celebrate the wedding of Mrs. Lyon a bear and a bull fight was held at the Vaca Ranch. The ladies witnessed the fight from the balcony of the Vaca adobe, afterward destroyed in the earthquake of 1892.

NEW ROAD SHORTER

The new highway location passes close to the old adobe, surrounded by old fruit and shade trees—some said to have been planted seventy-five years ago.

The following data will indicate the great improvement to be made by the new construction:

The present road, between the points where the new location ties into it at each end, has a total of twenty-three curves, twelve of which are of 300 foot radius, and none flatter than 1500 foot radius. The total angle included in these curves is 849° 33′ or nearly 2½ complete circles.

The new location, between the same points, has six curves, with one curve of 1000 foot radius; the rest being 3800 foot radius and over.

The total angle is 113° 26½′ less than one-third of a complete circle, and also less than 1/7 of the curvature in present road. There is also a saving in distance of nearly three-quarters of a mile in a span of less than four miles or about 19 per cent.

This project was advertised with alternate items for paving. The low bid was for the asphaltic concrete pavement, for which this contract was awarded.

The work to be done consists in general of constructing a graded roadbed 36′ wide, placing imported borrow for the full width of the roadbed and from 0.5 to 0.9 of a foot in depth below the bottom of the pavement.

A new reinforced concrete bridge is to be constructed over Alamo Creek with a clear roadway of 34 feet consisting of two 21′-6″ spans and one 27′ span, with concrete piers on steel piles.

This replaces a concrete county built bridge which has a clear roadway of 20′ and an overhead construction which limits the height of loads below the legal limit. Having a sharp curve at each end, this bridge introduces a serious hazard to auto traffic, which the new bridge will remove.

With the completion of this section, the most tortuous part of the present route between San Francisco and Sacramento will have been eliminated, which will mean a large aggregate saving to the more than 5000 vehicles which pass over this road daily during times of peak travel.

JACK FROST SHORTENED BAY BRIDGE CABLES BY 9 INCHES IN COLD SNAP

When icy winds swept down from the Alaska coast on October 31, they set a cold weather record in San Francisco and established a new record of an entirely different sort.

The low temperature—43 degrees, one degree lower than the previous cold record of October 14, 1881—brought Yerba Buena Island nine inches closer to San Francisco.

Cables of the San Francisco-Oakland Bay bridge shrank nine inches over the mile and a quarter of steel strands between Rincon Hill and the mid-bay island.

Bridge engineers said that the shrinkage made a good weather story and did no harm to the bridge. Structural plans allow for a two foot expansion and contraction of cables during high and low temperatures.

Half Moon Bay Road Grades Reduced from 10.64 to 7 Percent

(Continued from page 2)

for improvement, and a survey of the hill section was commenced.

It was evident from the start that it was not practical to construct a modern, high standard highway in the vicinity of the existing road; hence, a new location was made on the southerly side of the Pilarcitas Creek Canyon.

The result was that in order to connect from the Skyline Boulevard at the saddle of the Coast Range, to the paved portion of road on the valley floor, it was possible to reduce the total curvature from 3046°, or about $8\frac{1}{2}$ complete circles, to 490° or $1\frac{1}{3}$ complete circles; to increase the minimum radius of curvature from 50 feet to 360 feet, and to reduce the maximum rate of grade from 10.64% to 7%.

SAVING IN DISTANCE

The distance involved was reduced from 3.1 miles to 2.7 miles, a saving of nearly one-half mile. These improvements are of great value, particularly when considering the heavy truck travel, and also the great number of pleasure cars that use this road over the week ends and on holidays.

It was in November, 1934, that a contract was awarded to grade a 30-foot roadbed and place 22 feet of crusher run base 5 inches thick, and treat the surface with emulsified asphalt.

The major items involved in the construction were approximately: 400,000 cubic yards of roadway excavation; 1,700,000 station yards of overhaul; 10,500 tons of crusher run base, with 120 tons of emulsified road oil, 1600 tons of screenings and 50 tons of fuel oil.

More than a mile of 8-inch perforated metal pipe under-drain was required to care for seepage water. The easterly branch of Pilarcitas Creek is taken care of in a 72-inch corrugated metal pipe, while the main, or northerly branch is spanned by a redwood timber structure consisting of a 19-foot span over the stream with a 19-foot cattle and wagon pass adjacent thereto.

The total cost of the work was approximately $178,000.

The traffic which at present is about 4000 machines on Sundays, will appreciate the wide swinging, easy curves, and the smooth surface of the new road.

Highway Accidents a National Problem Says T. H. MacDonald

(Continued from page 9)

It is disappointing that so many of these state reports are looking backward rather than forward. There must be a recognition that competition is both in the character and in the cost of service.

MASTER HIGHWAY PLAN

Recognizing that three million miles of public roads offer a serious problem in basic planning of an adequate highway system, in which land use and all the social and industrial factors common to our population will determine highway necessities, the Secretary of Agriculture has approved a comprehensive highway planning survey in cooperation with the state highway departments.

This survey is already definitely programmed in about two-thirds of the states, and when completed will give all the facts upon which to base a master highway plan for the future.

One of the principal objects of this survey is to determine how best to serve the farm population which is not located upon the federal-aid and state systems of highways, so as to bring to the land the utility of an all-year road. It should be honestly recognized that a tremendous amount of the traffic on the highways now is not traffic lost to other agencies but is new business. Mr. Eastman recently estimated there had been created by the development of the motor car and improved highway more than four times the travel market that had previously existed. This business is highly competitive between communities as well as between facilities.

RECREATION A MAJOR INDUSTRY

Recreation has become a major industry. A roadway was opened in the Shenandoah National Park one year ago. The surfacing was not completed until within the past few months. On Sunday, October 20, more than 28,000 people traveled this new parkway. This was business which did not exist one year ago in that community. How much was wholly new business it is imposisble to tell, but here is a recreational area more than 80 miles removed from the nearest large city, and the miles of new travel in Virginia thus generated run into fantastic figures.

Federal legislation has been enacted and the new Motor Carrier Bureau created in the Interstate Commerce Commission to regulate the business of interstate public carriers. It is also charged with the duty of promulgating rules to promote safety on the highways. Nothing that might be said as to planning is more important than to hold up as a great national problem the drastic curtailment of accidents upon our streets and highways. Planning must take into consideration not only physical facilities but their use, which extends to legislation and regulation.

Some of the comprehensive activities in transportation planning have been mentioned here, but these are only a part, and we can expect as wonderful advances in the immediate future as we have had in the past. There is no field which comes more intimately into contact with the life of each one of us, both economic and social.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 13 DECEMBER, 1935 No. 12

"Streamlined" Highways

Construction policies that will develop "streamlined" highways adequate to serve America's streamlined automobiles will be advanced at the approaching Convention-Road Show of the American Road Builders' Association in Cleveland January 20–24, according to William P. McDonald, President of the association.

Mr. McDonald declared that public interest in the national highway program is more intense than at any previous time within the last six years, and that the convention program will include detailed consideration of many new factors that have entered highway development, including the pressing demands for constructing highways designed to meet the ever-increasing volume and speed of motor vehicle traffic.

He said the primary demand that existed a decade ago for hard-surfaced roads is now expanded to include road construction that will accommodate automobiles of high speed.

Mr. McDonald said the Hayden-Cartwright Act provided the groundwork for a three-year highway program, and this factor is enabling highway officials and contractors to buy new equipment with confidence that it will be needed in carrying out the construction program already assured.

Mary has a new tight skirt,
So neat, so bright, so airy;
It never shows a speck of dirt,
But it surely does show Mary.

Clarice (motoring): "I said you could kiss me, but I did not say you could hug me."

Henry: "Oh, that's all right; I just threw in the clutch."

Law Clear as to City Liability in Parallel Parking Violations

JUST as the automobile of yesterday, with its angle parking, ruled out the hitching post, so has parallel parking today sounded the death knell for angular stalls on State highways and many of the streets in cities of California.

The 1935 legislature, taking a tip from cities which reduced accidents and speeded up traffic with parallel parking, raised the strongest barrier against angle parking when it made it mandatory to parallel park on all through State highways and on such highways running through incorporated areas. The second greatest factor to endorse the safety method of parking was the action of the Los Angeles county board of supervisors which recently adopted an ordinance enforcing parallel parking as outlined by the legislature.

LAW IS CLEAR

Question of a city's liability in event an accident is caused through angle parking on highways which the state law says must use parallel parking, is one of the major reasons for incorporated areas to follow the Los Angeles action, according to E. Raymond Cato, chief of California Highway Patrol.

"The law is clear in its parallel parking demand," says Cato, "and I am advising incorporated areas to clearly mark their highways against angle parking to prevent what may result in court action in event an accident occurs."

Safety organizations backing the parallel parking system specify three reasons for its popularity: 1—Persons stepping from the curb between cars have clear vision of the highway; 2—Cars do not have to back into traffic when leaving a parking area; 3—A greater area for moving traffic is opened.

The new state law requiring parallel parking follows:

"Except when loading or unloading merchandise, no person shall park or leave standing any vehicle at the curb or edge of a through state highway unless both right wheels of the vehicle are within 18 inches of the curb or edge of such highway."

The Division of Highways of the Department of Public Works has been instructed by Director Earl Lee Kelly to cooperate with California Highway Patrol in assisting cities to meet demands of the new State law.

Building 3 Bridges and 3 Tunnels on 4.3 Miles of Feather River Highway

By **F. W. HASELWOOD,** District Engineer

CONSTRUCTION work on the Feather River Highway, now nearing the home stretch, is proceeding as rapidly as finances and the country encountered will permit.

Since 1928, work has been in progress eastward from Oroville and westward from Keddie on the seventy-mile unit of new construction, most of which follows the canyon of the North Fork of the Feather River or its tributaries. This work has been carried on continuously by two large convict camps, supplemented by contracts for bridge and grading work.

FIVE MILES TO GO

The frontiers of the two convict camps have gradually progressed toward each other until at the present time Camp 28, located at Rich Bar, is working as far down as Tobin, which is 29.7 miles below Keddie, while the front line trenches of Camp 30, located near Cresta, are at Grizzly Dome, which is thirty-six miles above Oroville. The advanced work of these two camps, therefore, is separated by but 4.3 miles.

Within this particular gap of 4.3 miles between Grizzly Dome and Tobin three contracts are nearing completion. One is for grading 2.4 miles between Rock Creek and Storrie, awarded October 25, 1934, involving an expenditure of $211,600.

Another contract covers the construction of a 300-foot steel truss bridge across the North Fork of the Feather River at Tobin, at a cost of $75,000.

The third contract covers construction of two bridges across the North Fork, one at Storrie and one at Rock Creek, at a total cost of $119,000. All three of these contracts are expected to be completed about the first of the year.

HIGHWAY BRIDGE UNDER RAILROAD

The completion of the bridge across the North Fork at Tobin will permit the crews from Camp 28 to continue their grading down the river toward Storrie.

The crossing of the North Fork at Tobin is one of the several unique situations encountered in the construction of this road. In contrast to the Pulga crossing, where the highway bridge spans the river directly over and across the bridge of the Western Pacific Railroad, the highway at Tobin passes under the Western Pacific bridge at the crossing of the North Fork.

The most difficult and expensive work in the canyon now confronts the crews of Camp 30. Precipitous granite cliffs rise from the water's edge to great heights. Workmen are suspended by ropes or find a footing on logs anchored to the face of the cliff by iron bars. Due to the precautions of those directing the work and the skill of the men assigned to these dangerous tasks, no accident has yet occurred in this difficult section of the work.

GALLERIES FOR TUNNEL

The strategy of the construction crews is fast solving the problem of constructing a highway across or underneath these bare and near vertical cliffs. The construction of three tunnels is in progress. The headings are completed and enlargement is in progress on the first two, which are 265 and 400 feet long. The third, which passes under the Elephant Butte section of Grizzly Dome, from which some 70,000 cubic yards of rock fell into the river last spring, will be 1,200 feet long.

This tunnel will have three adits or galleries on the river side, which will assist in the ventilation and lighting. Work is in progress on this tunnel from the west portal and from two adits.

Work from Camp 28 is directed by H. L. Waste, Superintendent, and R. E. Ward is Resident Engineer. E. R. Rawson is Superintendent at Camp 30, and George M. Webb is Resident Engineer.

You can't fool all of the people all the time, but somebody is trying it all the time.—*Savannah Morning News.*

"There's only one thing worse than trying to shave with a razor after the wife has sharpened a pencil with it."

"And what's that?"

"Trying to write with the pencil."—*Pearson's.*

GRIZZLY DOME HIGHWAY OPERATIONS in Feather River Canyon involve much heavy rock work. At top drillers are widening the 400 foot bore. Lower views show crew widening the highway bench beyond tunnel and, at right, the entrance to the bore. The tractor is on grade.

State Removing Snow on 54 Highways

(Continued from page 4)

The program for the 1935–1936 season includes the following roads:

Route No.	Name of Highway	Location of Works
1.	Redwood Highway,	Oregon Mt. and portions
3.	Pacific Highway,	Redding to Oregon Line
4.	Ridge Route,	Castaic to Grapevine
11.	Echo Summit,	Placerville to Kyburz
12.	San Diego-El Centro,	Alpine to Mt. Springs
13.	Sonora Pass Rd.,	Sonora to Long Barn
15.	Tahoe-Ukiah Highway,	Rough and Ready to Emigrant Gap
17.	Nevada City Lateral,	Auburn to Nevada City
18.	Merced-Yosemite,	Capay to El Portal
19.	Jackrabbit Trail,	Moreno Grade
20.	Weaverville Lateral,	Blue Lake to Redding Meadow Valley to Route 29
20.	Redding-Lassen Park,	Redding to Shingletown
21.	Quincy Lateral,	Oroville to Berry Creek
23.	Mono Rd.,	Mojave to Nevada Line
24.	Ebbetts Pass Rd.,	Angels Camp to Dorrington Markleeville to Nevada State Line
25.	Yuba Pass Rd.,	Downieville to Sierra City Sierraville to Route 83
26.	Imperial Valley Highway,	Redlands to Whitewater
28.	Alturas Lateral,	Redding to Nevada Line
29.	Susanville Lateral,	Dales to Nevada Line
31.	Arrowhead Trail,	Verdemont to Nevada Line
34.	Carson Pass Rd.,	Jackson to Bartons
35.	S. Fk. Trinity R. Rd.,	Bridgeville to Douglas City
37.	Donner Summit Rd.,	Auburn to Truckee
38.	Truckee River Rd.,	Emerald Bay via Truckee to Nevada State Line
39.	Brockway Rd.,	Tahoe City to Navada State Line
40.	Tioga Pass Rd.,	Groveland to South Fork
41.	General Grant Park Rd.,	Dunlap to Park
43.	Crest Route,	San Bernardino to Victorville via Big Bear Lake
46.	Klamath River Rd.,	Weitchpec to Shasta River
47.	Butte Meadows Rd.,	Chico to Forrest Ranch
57.	Walker Pass Rd.,	Bakersfield to Freeman
58.	Tehachapi Pass Rd.,	Arvin Road to Mojave
59.	Lancaster-Bailey Rd.,	Ridge Route to Lancaster
61.	L. A. Park Rd.,	Cajon Pass to Wrightwood
63.	Westgaard Pass Rd.,	Big Pine to Nevada Line
64.	Perris-Indio Rd.,	Hemet to Palm Springs
65.	Mother Lode Highway,	Auburn to Mariposa
72.	Weed-Klamath Falls Rd.,	Weed to Oregon Line
73.	Susanville-Lakeview Rd.,	Susanville to Oregon Line
76.	Huntington Lake Rd.,	Toll House to Deep Creek
76.	Montgomery Pass Rd.,	Bishop to Nevada Line
78.	Descanso-Temecula Rd.,	Descanso to Aguanga
82.	Etna Mills Rd.,	Yreka to Etna Mills
83.	Hobart Mills Rd.,	Hobart to Truckee
89.	Cobb Mountain Rd.,	Cobb to Lower Lake
95.	Coleville Rd.,	Coleville to Nevada Line
96.	Sweetwater Rd.,	Bridgeport to Nevada Line
112.	Mammoth Lake Rd.,	Jct. Rte. 23 to Lake Mary
125.	Wawona Rd.,	Hawkins School to Yosemite Park
127.	Camp Nelson Rd.,	Springville to Camp Nelson
188.	Camp Seeley Rd.,	Rte. 43 to Rte. 59
189.	Lake Arrowhead Rd.,	Rte. 43 to Rte. 59
190.	Mill Creek Rd.,	Forest Boundary to Camp Angeles
198.	El Cajon-Santa Ysabel Rd.,	Ramona to Santa Ysabel

HOUSING—EQUIPMENT SHELTERS

Snow-removal work requires not only proper equipment and organization, but also proper facilities for caring for both men and equipment. The cold weather and constant strain from removing wet or frozen snow cause frequent breakdowns of equipment. Lack of repair facilities and spare parts at the scene of action means a snow-blocked road. In the high altitudes, with the prevalence of strong winds and low temperatures, this may easily imperil the life of the motorist who drives these roads, relying upon the effectiveness of snow-removal efforts.

Likewise, an eight-hour trick at the wheel of a truck, plowing snow, is a strain on a man; and warm, comfortable quarters, with facilities for serving hot meals at any hour of the day or night, are essential.

QUARTERS FOR SNOW FIGHTERS

Permanent quarters designed for these needs have been provided east of Emigrant Gap and at the Summit on Donner Pass; at Mineral and Lost Creek on the Susanville Lateral; at Crestview, Conway Summit, and Sonora Junction on the Bishop-Reno road; and at five locations on the Crest Route between San Bernardino and Big Bear Lake. At other locations, the regular maintenance stations are adequate to serve the purpose.

On Donner Summit the layout consists of a truck shed of the roundhouse type, some one hundred feet in diameter, and includes a repair shop with pits and tools to handle major equipment repairs. A thirty-two-man bunkhouse is connected to the truck shed by a covered passage. The truck shed is sealed and a steam heating plant is installed to heat not only the truck shed but the bunkhouse as well.

Storms can be forecast, but their exact occurrence, intensity, or duration are matters

(Continued on page 30)

We'd at last gotten used to the neighbors
And the neighbors were used to us,
We'd fixed all the leaky faucets
And almost ceased to cuss
When the windows stuck in summer
And the rain came thru in fall,
And the neighbors' crying babies
We no longer heard at all,
So we felt we were pretty well settled,
As Highway people do,
Whenever they live in the same small house
For more than a month or two.
We'd saved up all of twelve dollars
And were feeling most sinfully rich,
And both of us bravely ignored the fact
That our feet were beginning to itch,
And that living in one small country town
For over a year and more,
Had ceased to seem like heaven
And was fast becoming a bore!
And then, when it seemed there was nothing left
That we could do or see,
And we thought of joining the local club
In desperate ennui,
The word came thru of a transfer!
We didn't know where or when,
And it didn't really matter
Since it meant we were MOVING again!

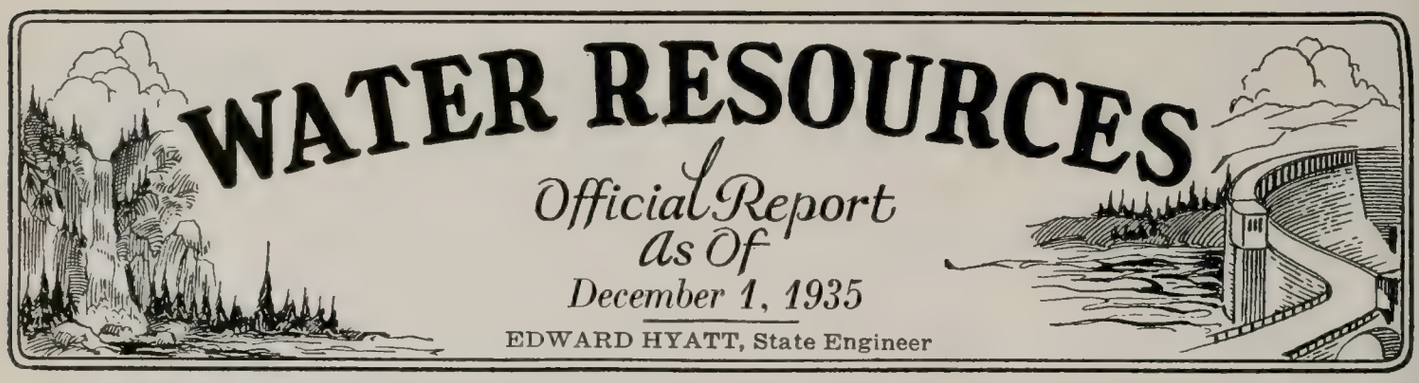
So we got out the packing cases
And wondered what went into which,
And "Cap" started making up bed-rolls
With an expertly tied half-hitch,
While I cleaned the kitchen cupboards
And thought: What on earth shall I do
With half of a bottle of cleaner
And a sink strainer, almost new?
And why did I save all these glasses
That once contained cottage cheese?
And when will they turn the gas off,
And where are the cellar keys?
Shall I take this sack of potatoes
I bought at last Saturday's sale?
And what about stopping the paper,
And also the milk and the mail?
And how will I pack my formal
So that it doesn't crush?
And where are my boots and trousers,
I'll need them out there in the brush.
Why did I buy that kitchen clock,
It's the deuce of a thing to pack!
And I must tell "Cap" to remember
To take the Browns' lawn mower back!

I wonder what he can be doing?
It's awfully quiet in there!
He's probably packing the iodine
In my best silk underwear!
I'll just go and see—There's the doorbell!
I wonder who that can be?
My hair is a wreck and I'm dirty,
I hope it's not callers for tea!

"Oh, Hello, Mrs. Brown! Yes, I'm packing.
"Oh, no, it's no trouble at all,
"I was just going to put on the kettle,
"So glad you could find time to call.
"And you brought little Junior! Oh, honey,
"Do you mind not sitting on that?
"What's in it? Why, not very much, dear,
"Only my new fall hat!
"Do you take cream or lemon? I'm sorry
"I haven't some cookies or cake,—
"Oh, Junior, that's ant paste! Don't eat it!
"That gives people stomach ache!
"Must you go, Mrs. Brown? Well, goodbye, dear,
"I hope that I'll see you again,
"Though we move so much in the Highway
"That it's hard telling where or when."

That's over! It's time for dinner
But I don't think we'll eat at home—
"Why, 'Cap,' you're all bloody! You're hurt—
"Oh, it's only mercurochrome?
"Well, go take a bath and get dressed, dear,
"We'll eat and then go to a show,
"The rest will be good for us both—
"What? You say that the water won't flow?
"And the phone has been disconnected?
"And the power has been shut off, too?
"And you just saw the gas man leaving—?
"Then there's only one thing to do:
"We'll put on our coats and just go as we are,
"And whatever the neighbors say
"We won't have to hear, since tomorrow
"Is Highway Moving Day!"

—GLADYS CRAIG POTTER,
(Wife of C. A. Potter, Resident Engineer,
District II, Redding, California.)



During the month work was put under way on flood control and reclamation work in Sutter, Yuba and Yolo counties that furnishes employment for approximately 170 men from relief labor rolls.

Applications were received for enlargement and reconstruction work on five dams and construction is progressing on five other similar projects in various parts of the State.

Under the Federal cooperative topographic mapping program nine new quadrangle sheets were published during the month. News of the irrigation districts, cooperative snow surveys, water distribution and other activities of the Division is presented in the monthly report of the State Engineer as follows:

IRRIGATION DISTRICTS

Several days were spent in the field in connection with reports on petitions from the Corcoran, West Side and Citrus Heights irrigation districts for authority for work under section 11 of the California Districts Securities Commission Act. The work for which authority was requested consisted of the relocation of 12 miles of main canal by the Corcoran district, the replacement with concrete of some 40 old wooden structures, canal lining and other work by the West Side district, and replacement and repairs on pipe lines by the Citrus Heights district.

California Districts Securities Commission.

Orders were issued by the commission to the following districts:

1. Byron-Bethany Irrigation District: Approving refunding plan through Reconstruction Finance Corporation loan of $372,500.

2. West Stanislaus Irrigation District: Approving change of plan; approving bonds for certification in the principal amount of $121,000, the said bonds to be used as security for PWA loan of like amount.

3. Approving assessment rates for 1935-36, under section 11 of the Securities Commission Act, for the following districts: Carmichael, Citrus Heights, San Dieguito and Waterford irrigation districts.

FLOOD CONTROL AND RECLAMATION

a. Maintenance, Sacramento Flood Control Project

Commencing November 11th, a small WPA crew has been engaged in miscellaneous work about the warehouse and headquarters, on the levees and on the ditches. This crew consisted of nine men at the start and has been increased to 17. As soon as it is increased to suitable size, about 30 men, it will be transferred to river channel clearing work.

b. Relief Labor Work.

Approval has been received on five WPA applications and preparations are being made to commence work.

Work will commence Monday, November 25th, with a crew of 60 men clearing the Feather River overflow channel above Marysville in Sutter County. A crew of 40 men will also commence work on November 25th in Yuba County, either on the Feather River overflow channel or the Bear River.

Work will be commenced on November 26th with 40 men in the Sacramento By-pass in Yolo County, filling an old cross ditch.

These projects have been slow in starting, but it appears now that the relief roll is building up rapidly, so that all of the approved projects will be fairly well started within the next six weeks.

c. Sacramento Flood Control Project.

Reports have been rendered on a number of applications before the Reclamation Board and inspections have been made on approved applications.

Considerable time has been spent in asssisting in the preparation of data and reports in connection with the modification of the construction and bank protection programs proposed by the U. S. Division Engineer.

Work is proceeding in the installation of pipes and other incidental construction for the south levee of the American River, contract for which has been let by the California Debris Commission. Actual earthwork will be commenced in about one week.

This office has completed the surfacing with gravel of a road upon the levee at Wholfrom warehouses above Colusa, at a cost of $500.

Work by the contractor under the California Debris Commission, for the construction of three drainage pumping plants on the Sutter By-pass, has been proceeding slowly awaiting delivery of material and equipment.

d. San Joaquin River.

Contract was awarded for construction of three units of levee in Reclamation District No. 2064, under Chapter 365, 1935, to close the three gaps in the levee. The contractor started work on November 1st, and it is expected to be completed by December 2d.

e. Flood Measurements and Gages.

All of the flood gaging stations and automatic recorders maintained by this office each winter are now in full operation, and arrangements have been made for making measurements of flood discharges should this be required.

Plan to Irrigate 50,000 Acres of Land

(Continued from preceding page)

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty-seven applications to appropriate water were received during October; 11 were denied and 14 were approved. Fourteen permits were revoked and the rights under 5 permits were confirmed by the issuance of license.

One of the applications received which is of major importance is that by the county of San Bernardino. This application proposes an appropriation of 1000 cubic feet per second and 110,000 acre-feet per annum from West Fork of Mojave River and Mojave River for irrigation and domestic purposes on 50,000 acres of land in San Bernardino County.

Inspections of projects under permit preliminary to the issuance of license, were made in Butte, Colusa, Placer, Sacramento, Sutter and Yolo counties. Work of this character is concluded for the current season.

On October 1st reports were requested from 1310 permittees and on October 15th reports were requested from 477 licensees. These reports are coming in daily and are being subjected to analysis for the purpose of determining the status of the projects covered by permit and license.

DAMS

Application for approval of plans and specifications for enlargement of the Veeh Dam in Orange County was filed November 1, 1935. The proposed enlargement will raise the crest 5.75 feet and increase the storage capacity of the reservoir from 46 to 108 acre-feet. The estimated cost of the work is $500.

Application for approval of plans and specifications for enlargement of La Patera Dam in Santa Barbara County was filed November 15, 1935. The enlargement will increase the height 2 feet and the storage capacity of the reservoir from 162 acre-feet to 201.8 acre-feet. The work is estimated to cost $1,100.

Application for approval of plans and specifications for alteration to the Pine Grove Dam in Nevada County was filed October 24, 1935. The work contemplated consists of the removal of the existing spillway, the construction of a new and larger spillway in a different location, and repairs to the outlet conduit and gate structure.

Application for approval of plans for alteration of the American River Head Dam of the Pacific Gas and Electric Company in El Dorado County was filed November 2, 1935. The proposed work consists of reconstruction of one abutment wall. This application was approved by the State Engineer November 13, 1935.

CONSTRUCTION WORK UNDER WAY

Construction work under way in southern California on San Gabriel No. 1 Dam of the Los Angeles County Flood Control District, Cajalco Dam of the Metropolitan Water District and Grant Lake Dam of the city of Los Angeles is proceeding satisfactorily. Repairs on the Lake Sherwood Dam in Ventura County are nearing completion.

The construction work on the Santa Clara Valley Water Conversation District's dams is nearly completed. Work on the enlargement of the O'Shaughnessy Dam of the city of San Francisco and the construction of the West Valley Dam in Modoc County is proceeding slowly, but in a satisfactory manner.

At the Mad River Dam for the city of Eureka the work is still in the excavation stage, and at Arcata Dam the work other than clearing and stripping will be delayed until spring.

Major alterations and repairs on the Lake Francis Dam of the Pacific Gas and Electric Company and on the Huntington Dam of the Southern California Edison Company are nearing completion.

Overpour protective work at the Combie Dam of the Nevada Irrigation District on Bear River and the Melones Dam of the Oakdale and South San Joaquin irrigation districts on the Stanislaus River is practically complete.

Minor repair and maintenance work such as painting of exposed concrete faces for decrease of seepage, clearing of spillways of debris, installation of booms, testing and checking of operating mechanisms and removal of spillway gates and flashboards is under way in preparation for the coming run-off season.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Office work is proceeding on compilation of the 1935 report covering the diversions, stream flow, and return flow in the Sacramento-San Joaquin territory and salinity in the delta.

The flow of the Sacramento River at Sacramento in early November was about 7000 second-feet with little recent variation. The flow of the San Joaquin River near Vernalis was 1700 second-feet early in the month.

There has been a continued recession of salinity during the past month so that salinity of 100 parts of chlorine per 100,000 is now below Antioch and Collinsville.

CALIFORNIA COOPERATIVE SNOW SURVEYS

Practically all arrangements for the snow surveys in the coming season have been completed. Through the cooperating agencies, surveys will be made to furnish data from which forecasts of the April-July, 1936, stream flow will be made for all of the major stream basins. The principal surveys will occur about the end of March.

Office work is in progress in bringing natural flow computations up to date, compiling normals, etc., and otherwise assembling and correlating the data upon which no work was done during the period July, 1933, to August, 1935, when the snow survey work as a State project was temporarily discontinued.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Progress was made during October in connection with the field work on the Paynes Creek and Burney

(Continued on page 26)

Topographic Survey Sheets Covering 9 Areas Published

(Continued from page 25)

Quadrangles in Tehama and Shasta counties which are Federal sheets, and on the Sebastopol Quadrangle in Sonoma County, which is a cooperative sheet. Progress was made also in connection with the office work on Cucamonga No. 4 Quadrangle sheet in San Bernardino County, which is also a cooperative sheet.

The following published sheets made their appearance during the month:

Dunsmuir Quadrangle— Final sheet on a scale of 1:125,000 with 100′ contours.

Oildale Quadrangle— Final sheet published on a scale of 1:31,680 with a contour interval of 5′.

West Camp Quadrangle—Final sheet published on a scale of 1:31,680 with a 5′ contour.

Reef Ridge Quadrangle—An advance sheet published on a scale of 1:31,680 with contour intervals of 5′ and 25′.

Dark Hole Quadrangle— An advance sheet published on a scale of 1:31,680 with contour intervals of 5′ and 25′.

Azusa, Mt. Wilson, Little Tujunga and Mt. Lowe Quadrangles— Advance sheets covering areas in Los Angeles County published on a scale of 1:24,000 with contour intervals of 5′ and 25′, the work being done by the Geological Survey in cooperation with the County of Los Angeles.

The Dunsmuir, Oildale and West Camp are cooperative sheets, the former covering areas in Siskiyou and Shasta counties, the Oildale sheet covering areas in Kern County and the West Camp sheet covering areas in Kern and Kings counties.

WATER RESOURCES

South Coastal Basin Investigation.

Work on the South Coastal Basin Investigation has continued along routine lines during the present month.

Central Valley Project.

The United States Bureau of Reclamation is making progress in initiating work on the Central Valley Project in California for which the President has approved an initial allotment of $15,000,000. Their engineers are studying the various units of project proposed for immediate construction and are working closely with the State Engineer. The Department of Public Works is cooperating in every way possible with the Bureau of Reclamation in speeding work on the project and proposes financing the drilling operations at the site of the combination highway and railroad bridge over the Pit River.

Yerba Buena Tunnel Bore Completed with Removal of all Core

THE YERBA BUENA Tunnel for the San Francisco-Oakland Bay Bridge is a reality.

Boring through the island has been completed and the last of the core removed. Construction of the upper deck of the huge transbay structure, which will cut the tunnel in half horizontally, has been started.

Inside its thick concrete walls the tunnel is 66 feet wide and 53 feet high. The accompanying photograph shows how an automobile is dwarfed in size by the height and width of the bore, the largest of its kind in the world.

DRIVE THREE BORES

The tunnel is completely lined with concrete of a minimum thickness of four feet on its side walls and a minimum thickness of three feet over its crown. Chief Engineer C. H. Purcell and his staff actually built the tunnel and then bored it out.

Open portals at the east and west end of the island tunnel first were excavated. The engineers then drilled three bores through Yerba Buena, two at either lower side and one in the crown, blocked out in a horseshoe-shaped excavation, which then was concrete and steel lined from three to four feet. The rocky core within the tunnel walls then was dug out with mammoth power shovels.

TWO TRAFFIC DECKS

The tunnel is 540 feet in length. Together with a reinforced concrete viaduct and four 288-foot steel truss spans, it constitutes the midbay portion of the great San Francisco-Oakland Bridge.

The bore will amply accommodate the bridge structure with its two traffic decks, the upper with six lanes for fast automobile travel and the lower with three lanes for heavy trucks and two tracks for interurban trains. The roof of the tunnel is supported by 16-inch steel arch ribs spaced every three feet and inbedded in concrete with a crown thickness of three feet.

The Yerba Buena Crossing was the fifth contract for the bridge awarded by the Department of Public Works and called for an island anchorage, tunnel, piers, concrete viaduct and relocation of certain existing roads and buildings on the military and naval reservation. This work will cost $1,821,129.50.

A pedestrian is a man who missed the payments on his car.

BAY BRIDGE TUNNEL BORE on Yerba Buena Island just completed is 76 feet wide by 58 feet high making it the largest bore tunnel in the world. Note size compared with trucks.

REMOVING LAST OF CORE—A horseshoe shaped excavation was made through the rock which was then concrete and steel lined before the inside or core of the tunnel was dug out.

UPPER DECK CONSTRUCTION is begun at far end of tunnel to accommodate six lanes of fast automobile travel. Lower deck will have three truck lanes and two railroad tracks.

U. S. Funds Finance Road Landscaping

(Continued from page 14)

tion and personnel handling roadside improvement work, until at the present time, the organization is made up of a landscape engineer, with an assistant, two landscape draftsmen, and from one to five tree foremen and crews in each of the eleven districts throughout the state. These men have all passed civil service examinations and are sufficiently experienced and capable to handle the required work.

Plans and specifications for all phases of improvement work are prepared in the Sacramento headquarters office. However, it has been only within the last two years that any appreciable progress has been made. The government requirement that 1 per cent of the federal and state allocation for the construction of roads in California be expended on improvement projects has given the opportunity, heretofore impossible by reason of lack of funds, to develop some worthwhile projects.

Two large projects—the Santa Monica Palisades and the new through Boulevard in Santa Barbara, are being supplied with hand labor through the SERA and WPA, the state furnishing the equipment, materials, and supervision. It is estimated that the cost of these projects when completed will exceed $80,000. It is projects of this nature that it would be impossible to carry out were it not for the availability of government funds.

LARGE LANDSCAPING PROJECT

The main east entrance to Los Angeles—the Ramona Boulevard, five and nine-tenths miles in length—was landscaped at a cost of some $23,000. Here is an example of beneficial maintenance expenditure estimated at $5,000 a year.

The design was such that undesirable views would be screened and pleasing vistas and skyline effects produced. Native California plant material was used almost entirely, in order to create as natural a landscape as possible and because indigenous material will require less maintenance as it becomes established.

Other large projects include a ten-mile planting between Encinitas and Oceanside on the coast highway to San Diego; the north entrances to Ventura and Santa Barbara; and one that is quite unusual—the mission-style development at the intersection entering San Juan Bautista, in San Benito County. This will serve as an entrance to one of our most picturesque missions and will be constructed in true mission style from adobe brick and tile.

A campanile and cross will be the main architectural features—landscaped with plants used by the old padres when the missions were first founded. This will represent a type of roadside development that will require a minimum of maintenance.

The north and west entrances to Sacramento are being improved. The west entrance development, connecting with the new Sacramento River bridge, represents a new type of roadside development for city entrances. Curbs, gutters, sidewalks, individual water supply and irrigation system, trees, shrubs, and grass are to be installed.

ENTRANCE TO SACRAMENTO

The total cost of this project is estimated at approximately $28,000. Necessary continuous maintenance will exceed $2,000 a year. The north entrance is being planted to trees and shrubs, in order to screen the railroad from the highway. Here the soil and climatic conditions demand constant watering for several years, and a water system is being installed to provide more economical watering than would be possible were it necessary to haul water in tank trucks for the maintenance of this planting.

The landscaping program for 1936 will include several similar projects throughout the state, but more emphasis is being placed on projects that will be of immediate practical benefit to the public, such as drinking fountains, picnic areas, and scenic points, where the first cost is followed by minimum maintenance costs.

Also, the hand labor requirements of the government are being utilized to experiment with erosion control on cut slopes and to obliterate scars of construction, in an endeavor to illustrate that practical roadside improvement or landscaping can pay dividends as well as be a constant drain on maintenance funds.

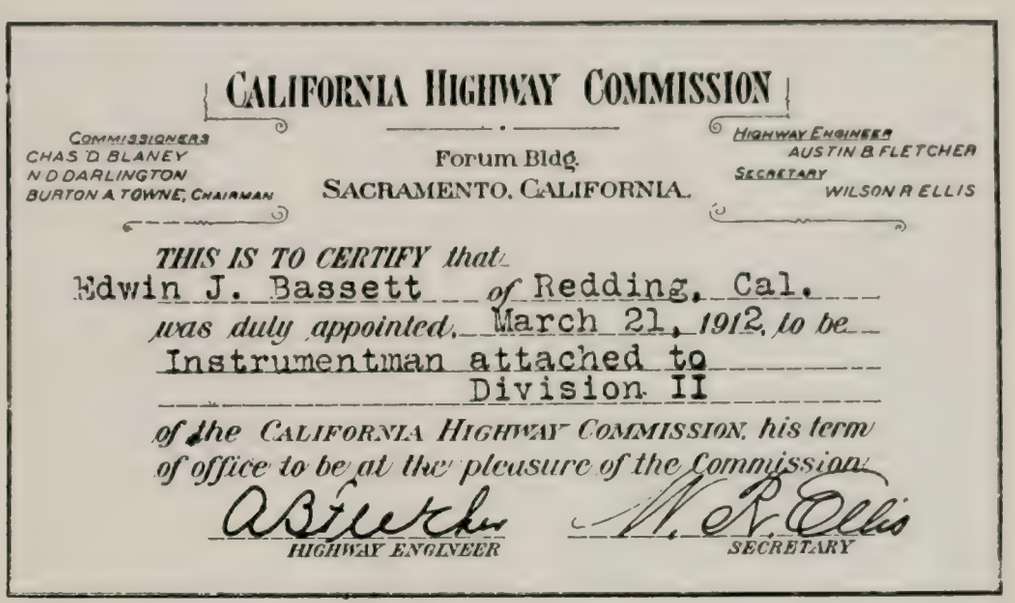
For jaywalkers every year is a leap year.

Old Timer, Do You Hold a Card to Beat This?

THERE is competition in the Old Timers' Club of the State Division of Highways for the honor of being the first charter member.

Possession of one of the identification cards issued by the old California Highway Commission in 1912 and thereafter to every man appointed on the staff of a division engineer is the only membership requirement.

Last month Thomas H. Dennis, Maintenance Engineer of the Division of Highways, assumed the position of head man when he produced an identification card certifying to his employment as an instrument man attached to Division V, San Luis Obispo, which bore the date March 21, 1912. Now comes E. J. Bassett, District Office Engineer, District 11, with a card issued on the same day.



CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS. D. BLANEY
N. D. DARLINGTON
BURTON A. TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B. FLETCHER
SECRETARY
WILSON R. ELLIS

THIS IS TO CERTIFY that
Edwin J. Bassett of Redding, Cal.
was duly appointed, March 21, 1912, to be
Instrumentman attached to
Division II
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A. B. Fletcher
HIGHWAY ENGINEER

W. R. Ellis
SECRETARY

FIRST PLACE TIE—Card of E. J. Bassett bears same date as T. H. Dennis card shown last month.

RIVALRY KEEN

"This card should, I believe," writes Mr. Bassett, "give me equal rights with Mr. Dennis."

Evidently Mr. Bassett thinks he might have received his appointment some hours earlier than Mr. Dennis, for he laments:

"If these cards had only been numbered!"

The rivalry of these two, however, may lose some of its importance as Mr. Bassett adds:

"Mr. F. W. Haselwood, my superior in District 11, informs me he holds a card older yet, and it may be that he will submit his as a membership application."

CAN'T PRODUCE CARD

Mr. Bassett and Mr. Dennis have another rival although the latter's aspirations are somewhat beclouded by a technical question which the members of the Old Timers' Club will have to settle themselves.

The question is raised by J. C. Alstrom of Willits, Mendocino County. Records of the California Highway Commission show that Mr. Alstrom was employed March 15, 1912, six days before the issuance of identification cards to Mr. Dennis and Mr. Bassett. BUT—Mr. Alstrom can not produce his credentials. He writes:

"I went to work for the State in the then newly organized Highway Department on March 15, 1912. My position was Chief of Party on location in District 111, of which W. C. Howe was District Engineer, and I was with Mr. Howe there until he was transferred to District V, when he took me and my party with him. I was with him until July 8, 1917 * * *. I never heard of any appointment card when I was employed. I think it would be a nice little souvenir for a person to have. I wonder what has become of my card? I am interested in securing it if it still is around and to be found."

RECORDS SUPPORT CLAIM

Mr. Alstrom says the members of his first party were Jerry Devine, instrument man; Fred Anderson, chainman-rodman, (deceased); E. R. McEwen, chainman-rodman; and Charles Casey, teamster.

Aging records of the old California Highway Commission reveal Mr. Alstrom's appointment on March 15, 1912, the commission having voted to employ him on February 22 of that year, and there is a notation that in part answers his inquiry as to what became of his card. The notation reads: "Identification card sent."

Snow Removal Operations Described

(Continued from page 22)

of conjecture. In the heavy snow areas, it is therefore necessary to have an adequate force, subject to call at all times. In these areas storms have been known to last for a week, piling up a total of eight to ten feet of snow. Again, heavy winds following the end of a storm have created almost as much work, by drifting the newly fallen snow.

Snow removal usually starts with the storm and continues throughout its duration. The first units out are the 3½ to 5-ton four-wheel-drive trucks equipped with speed plows of the "One-Way" or "Reversible" type. This equipment, operating at twenty to thirty miles an hour, pushes the snow to the sides of the road until the storage space is filled.

Where the total fall does not exceed two feet, these plows are capable of maintaining some ten to fifteen miles of road. Falls in excess of this amount require additional storage, which is acquired by pushing the snow beyond the limits of the roadway with a wing plow attached to the side of the truck and extending outward beyond the roadway.

Where the fall is greater than can be handled with the above equipment, truck or tractor-driven rotary plows are required to throw the yarded snow well beyond the roadway limits to provide space for the next fall. A combination of speed and rotary plows has successfully handled a total season's fall of forty feet.

"V"-TYPE WORKS FAST

The "V"-type speed plow, having a five-foot vertical height and eleven-foot wing spread, has demonstrated its effectiveness wherever road alignment permits of fast operation. This plow will handle two to three feet of loose snow without pause, and is capable of bucking through drifts four to six feet in height. The side wings aid materially in furthering the outward disposal of the snow carried upward by the "V." This unit is particularly valuable at locations where the season's fall does not exceed six feet, though occasional heavy falls and drifts can be expected.

Several types of rotary plows have been developed, either truck or tractor operated. Of these, the most promising is the auger-blower type. A single engine, developing 175 horsepower, drives both plow and truck. The snow is picked up by two sets of augers mounted horizontally, normal to the road surface at the front of the machine. The revolving augers break up the snow and carry it inward to a centrally located blower, from whence it can be directed outward in either direction. It is possible to throw snow some one hundred feet with this unit.

An attachment for this rotary is a long upper boom, equipped with claw-like teeth which tear down the drifts, moving back and forth across the face of the auger blades. With this attachment, drifts ten feet high and over can be worked down to the augers.

TRAILER WIDENS ROAD

The trailer widening rotary is a comparatively recent development especially adapted to locations where restricted storage impedes removal. The four-foot rotor is trailed on an offset hitch by a truck, after the snow has been bladed to the roadsides. It will widen banks up to five feet in height, throwing the snow a considerable distance off the road. The cleanup, however, is somewhat loose, as a small amount of snow either falls back or is thrown outward into the roadway by the rotor.

The power plant consists of a motor generating 114 horsepower at 1800 r.p.m. This unit effects a real economy, lessening equipment investment under conditions normally requiring an expensive truck-mounted rotary.

The following equipment, which is all state-owned, is used on snow-removal work:

139 trucks ranging from 2½ to 5-ton capacity
29 5-ton tractors
120 truck-operated displacement plows
19 truck-operated rotary plows
5 tractor-operated displacement plows
1 tractor-operated rotary plow
22 graders, tractor pulled

COST OF REMOVAL

The cost of snow removal varies of course with the conditions encountered. Naturally it is less expensive in the lower altitudes where the removal is effected in conjunction with the routine maintenance activities. In the high mountain area where removal is the major objective, special crews and equipment must be held in readiness throughout the winter season.

The amount of fall, water content of snow, and drift conditions, all affect the cost of

(Continued on page 32)

Highway Bids and Awards

for November, 1935

ALAMEDA COUNTY—Overhead Xing over S. P. R. R. near El Cerrito Hill in Albany. Reinforced concrete girder spans and steel girder spans with concrete deck. District IV, Route 69, Section Albany. Lingren & Swinerton, Inc., San Francisco, $251,798; Bodenhamer Construction Company, Oakland, $251,297; Pacific Bridge Co., San Francisco, $262,692; Healy Tibbitts Construction Co., San Francisco, $265,727; Fredrickson-Watson Construction Co. & Fredrickson Bros., Oakland, $269,617; McDonald & Kahn Co., Ltd., San Francisco, $272,163; Clinton Construction Co., San Francisco, $278,262; M. B. McGowan, Inc., & C. W. Caletti & Co., San Francisco, $283,786. Contract awarded to J. F. Knapp, Oakland, $249,281.

ALAMEDA COUNTY—Between San Francisco Bay Bridge and Folger Avenue. About 4 miles to be graded and paved with asphaltic concrete. District IV, Routes 5 and 69, Section Oakland-Emeryville-Berkeley. A. Teichert & Son, Inc., Sacramento, $278,343; Peninsula Paving Company, San Francisco, $268,938; Heafey-Moore Co., Oakland, $277,934; Union Paving Co., San Francisco, $263,456; Fredrickson & Watson Construction Co., Fredrickson Bros.-Jones & King, Oakland, $266,413; Southern California Roads Company, Los Angeles, $321,622. Contract awarded to Hanrahan-Wilcox Corp., San Francisco, $247,353.

CONTRA COSTA COUNTY—A reinforced concrete girder overhead structure over the A. T. & S. F. Ry. 3½ miles north of Concord and about 0.18 mile of roadway to be graded and surfaced with plant mix surfacing. District IV, Route Feeder Rd., Section Maltby O. H. Xing. A. Soda &' Son, Oakland, $19,614; McHugh & Heilman, San Francisco, $22,438. Contract awarded to A. T. Howe, Santa Rosa, $17,702.

IMPERIAL COUNTY—Between 4 miles west of Westmoreland and Trifolium Canal. 3.2 miles plant-mix surface. District XI, Route 26, Section A. R. E. Hazard & Sons, San Diego, $41,785. Contract awarded to Oswald Bros., Los Angeles, $39,898.

INYO COUNTY—Grading 7.3 miles between Death Valley Jct. and California-Nevada State line. District IX, Route 128, Section A. A. S. Vinnell Co., Los Angeles, $10,351; Contract awarded to Basich Brothers, Torrance, $9,864.50.

LASSEN COUNTY—Between Long Valley Creek and 2.8 miles north of Route 21. About 9.2 miles to be graded and a bituminous seal coat applied. District II, Route 29, Section E. Peninsula Paving Co., San Francisco, $128,160; George Pollock Co., Sacramento, $163,894; Isbell Construction Co., Reno, Nevada, $151,812; Dunn & Baker, Klamath Falls, Oregon, $148,530; Hemstreet & Bell, Marysville, $152,554. Contract awarded to Harms Bros., Sacramento, $127,322.

LOS ANGELES AND KERN COUNTIES—Between ¼ mile south of Kern County Line and Fort Tejon. About 5.5 miles to be graded, paved with Portland cement concrete and a reinforced concrete bridge constructed. District VI, Route 4, Sections D. and A. Gibbons & Reed, Burbank, $382,264; Basich Bros., Torrance, $396,517; Granfield, Farrar & Carlin & N. M. Ball, San Francisco, $368,451; Southern California Roads Co., Los Angeles, $380,580. Contract awarded to Griffith Co., Los Angeles, $342,975.

LOS ANGELES COUNTY—A reinforced concrete stairway to pedestrian overhead 0.5 mile north of Colorado Avenue. District VII, Route 60, Section Santa Monica. Carl Hallin, Los Angeles, $8,235; J. B. McIntosh, Glendale, $8,535; Hoagland Engr. & Construction Co., Long Beach, $9,416; L. W. Odell, Los Angeles, $9,849; Contracting Engr.'s, Inc., Los Angeles, $10,461. Contract awarded to Parish Bros., Los Angeles, $6,884.

LOS ANGELES—Marengo Street between Soto and Cornwell Street; 0.5 mile to be graded and paved with asphaltic concrete and plant mix surfacing. District VII, Route 4, Section Los Angeles. Mike Radich, Los Angeles, $7,651; Griffith Co., Los Angeles, $7,991; C. F. Robbins, Los Angeles, $8,315; Paul R. Hughes, Long Beach, $8,704. Contract awarded to Tomei Construction Co., Culver City, $7,410.

LOS ANGELES COUNTY—In Santa Monica at 4th Street railway grade crossing construct a flood lighting system. District VII, Route 60, Section Santa Monica. Norton & Norton Electrical Co., Ltd., Los Angeles, $845; Walker Martin Corp., Ltd., Los Angeles,, $983. Contract awarded to D. S. McEwan, Santa Monica, $835.

LOS ANGELES—Rosemead Blvd., between San Gabriel Blvd. and Ramona Blvd. About 3.5 miles to be graded and paved with Portland cement concrete. District VII, Route 168, Section B. and C. George Herz & Co., San Bernardino, $144,316; J. L. McClain, Los Angeles, $127,366; Basich Bros., Torrance, $136,627; Matich Bros., Elsinore, $119,952; Gogo & Rados, Los Angeles, $127,866; J. E. Haddock, Ltd., Pasadena, $138,267; Oswald Bros., Los Angeles, $119,455. Contract awarded to C. O. Sparks, Los Angeles, $116,866.

MARIN COUNTY—Furnish and apply Armor Coat to roadway and Seal Coat to shoulders between Belvedere Crossing and Tiburon. About 1.3 miles. District IV, Route 52, Section A-Blv. Lee J. Immel, Berkeley, $7,516; A. G. Raisch, San Francisco, $8,449; Palo Alto Roads Materials Co., Ltd., Palo Alto, $7,425. Contract awarded to E. A. Forde, San Anselmo, $6,891.

MONTEREY COUNTY—Across Thompson Gulch, about 3 miles north of King City. About 0.2 mile to be graded and surfaced with crushed run base and natural rock asphaltic surfacing. District V, Route 2, Section E. J. L. Conner, Monterey, $32,174; Granfield, Farrar & Carlin, San Francisco, $35,640; L. A. Brisco, Arroyo Grande, $31,462; Stewart & Nuss, Inc., & J. Jurkovich, Fresno, $31,839. Contract awarded to A. Teichert & Son, Inc., Sacramento, $29,316.

MONTEREY COUNTY—Between 3 miles north of Big Sur and Molera's Ranch. About 1.8 miles to be graded and surfaced with bituminous treated screen river gravel (road mix method). District V, Route 56, Section F. Force Construction Co., & W. A. Kettlewell, Oakland, $91,146; George J. Bock Co., Los Angeles, $88,888; George Pollock Co., Sacramento, $95,666; J. L. Conner, Monterey $88,684; Peninsula Paving Co., San Francisco, $79,602. Contract awarded to Granfield, Farrar & Carlin, San Francisco, $77,586.

ORANGE COUNTY—At Newport Beach constructing grade separation and 0.8 mile approaches graded and paved with asphaltic concrete and Portland Cement Concrete. District VII, Routes 43 and 60, Section Newport Beach, A and A. Sharp & Fellows Contracting Co., Los Angeles, $173,459; Oscar Oberg, Los Angeles, $176,688; M. B. McGowan, Inc., San Francisco, $177,686; J. E. Haddock, Ltd., Pasadena, $181,747; R. R. Bishop, Long Beach, $188,340; Griffith Co., Los Angeles, $199,363; Daley Corp., San Diego, $208,008. Contract awarded to Mundo Engineering Corp., Los Angeles, $154,922.

SACRAMENTO COUNTY—Between Courtland and Freeport. About 0.4 mile constructing riprap slope protection. District III, Route XI, Section E. and F. Blake Bros., Co., San Francisco, $30,153; Hutchison Co., Oakland, $31,391. Contract awarded to Healy-Tibbitts Construction Co., San Francisco, $28,802.

SAN DIEGO COUNTY—At Santa Margarita River. About 0.7 mile to be graded. District XI, Route 2, Section C. V. R. Dennis Construction Co., San Diego, $32,815; A. S. Vinnell Co., Los Angeles, $33,815; Geo. J. Bock, Los Angeles, $34,505; Sharp & Fellows Construction Co., Los Angeles, $35,555; Daley Corp., San Diego, $39,550; Dimmitt & Taylor, Los Angeles, $40,957; R. L. Oakley, Los Angeles, $43,155; C. G. Willis & Sons, Inc., & Chas. G. Willis, Los Angeles, $49,853. Contract awarded to Basich Bros., Torrance, $30,430.

SAN DIEGO COUNTY—Over A. T. & S. F. Ry., ½ mile north of Del Mar, widen structure and widen and asphaltic concrete pave approaches. District XI, Route 2, Section A. Lynch-Cannon Eng. Co., Los Angeles, $37,944; R. L. Oakley, Los Angeles, $42,999; R. R. Bishop, Long Beach, $31,336; M. H. Golden, San Diego, $31,880; Byerts & Dunn, Los Angeles, $33,674; Parish Bros., Los Angeles, $26,554; B. O. Larsen, San Diego, $32,864; Contracting Engineers,

(Continued on page 32)

Snow Roads Total 57,000 Vehicle Miles During the Winter

(Continued from page 30)

removal. Removing the wet snow on Donner Summit is found to be more expensive than an equivalent removal of dry snow on the Red Bluff-Susanville lateral. On the other hand, the cost of removing lighter falls of dry snow on east slopes of the Sierra between Bridgeport and Bishop is greater than on either of the routes mentioned, due to the heavy winds which drift the snow for days after the snowstorm is over.

Periodical traffic counts have been made on these snow roads for several years to determine the justification of this removal. These counts indicate that some fifty-seven million vehicle miles occur on these roads during a normal winter season. The total vehicle miles traveled on these snow roads during the winter season are equivalent to the total vehicle miles traveled during one and one-fourth days on all roads and streets in California, or equal to the total vehicle miles traveled for three days on every road and street in Los Angeles County.

TRAFFIC PAYS COST

The total cost of removal last year was $346,000, or an average cost of removal of six-tenths of one cent per vehicle mile. This cost is but half of what the motorist returns from the gasoline fuel tax; but when one considers the tieing up of 3,000 miles of road, which cost an average of $15,000 a mile, even for a period of sixty days, it will be seen that the interest charges at 4 per cent will alone almost justify the cost of removal.

We may confidently expect that this work will expand as the mountain roads are improved to the standards required for snow removal. The great investment in roads and automobile equipment, as well as the business activities associated with snow sports, will further this work, until California's highways will eventually return a year-round interest on their investment.

California Highway Patrolmen traveled a total of 45,049 miles in the first nine months of this year to serve warrants for traffic violations.

Golf is the tie that binds many a husband and wife by separating them on Saturdays, Sundays and other fighting holidays.—*National Motorist.*

In Memoriam

LOUIS B. PROSPER, who entered the State service in January, 1919, and had been employed continuously since that time as a Maintenance Foreman in the Ventura District, passed away on November 9, 1935. Mr. Prosper was born in Holton, Maine, in 1879.

Prior to coming to California in January, 1919, Mr. Prosper was employed for several years by the Massachusetts Highway Commission and came into the State service in California very well recommended. He was a very capable man and made an excellent Maintenance Foreman.

Everyone in the Ventura District knew "Louie"; knew him for his pleasing personality and kindness, and knew him to be a loyal and faithful employee of the State Division of Highways, who was always willing to serve, keeping the interests of the highways under his care foremost in his mind. His passing is grieved by his fellow workers in District VII and by the host of other friends he made during his long service with the State.

Mr. Prosper leaves a widow, Helen May Prosper, and our sincere sympathy goes out to her.

HIGHWAY BIDS AND AWARDS

(Continued from page 31)

Inc., Los Angeles, $37,147. Contract awarded to E. S. & N. S. Johnson, Pasadena, $25,992.

SANTA CLARA COUNTY—Undergrade Xing under S. P. R. R. at San Jose. 2 concrete abutments and st. supers. and about 0.14 mile to be graded and paved with Portland cement concrete. District IV, Route Feeder Road, Section Almaden Road Xing. Rocca & Co., San Rafael, $71,701; Lord & Bishop, Sacramento, $72,116; Earl W. Heple, San Jose, $73,710; M. B. McGowan, Inc., San Francisco, $76,148. Contract awarded to A. J. Raisch, San Jose, $70,766.

SOLANO-NAPA COUNTIES—Between 1 mile north of Carquinez Bridge and Cordelia. About 11.2 miles to be graded and paved with Portland cement concrete.. District X, Route 7 and 8, Sec. F, G, H, and A. N. M. Ball Sons and Bodenhammer Construction Co., Berkeley, $442,117; A. J. Raisch and A. G. Raisch, San Francisco. $460,341; Fredrickson & Watson Construction Co., Fredrickson Bros., Jones & King, Oakland, $439,686; Basich Bros., Torrance, $461,804; Peninsula Paving Co., San Francisco, $461,556; A. Teichert & Son, Inc., Sacramento, $466,919; Union Paving Co., San Francisco, $472,338. Contract awarded to Hanrahan-Wilcox Corp., San Francisco, $434,428.

VENTURA COUNTY—A. C. M. P. Drain to be constructed 12.5 miles north of Ventura. District VII, Route 2, Section F. B. Frank Barr, Ventura, $16,120; Basich Bros., Torrance, $16,167; Mike Radich, Los Angeles, $19,252. Contract awarded to Parish Bros., Los Angeles, $8,404.

VENTURA COUNTY—Between Newberry Park and Conejo Creek, 4.8 miles graded and paved with asphalt concrete, Portland cement and plant-mix. District VII, Route 2, Section B. Sander Pearson & Mundo Engineering Co., Los Angeles, $526,340; Granfield, Farrar & Carlin, San Francisco, $463,719; J. E. Haddock, Ltd., Pasadena, $495,261; Lewis Construction Co., Los Angeles, $554,227; Geo. Pollock Co., Sacramento, $569,130; Gibbons & Reed Co., Burbank, $516,532. Contract awarded to Mittry Brothers Const. Co., Los Angeles, $466,036.50.

Just when you think you can make both ends meet, somebody moves the end.

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

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Port of Eureka—William Clark, Sr., Surveyor

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MAP
SHOWING
STATE HIGHWAY SYSTEM

LEGEND
Primary Roads
Secondary Roads

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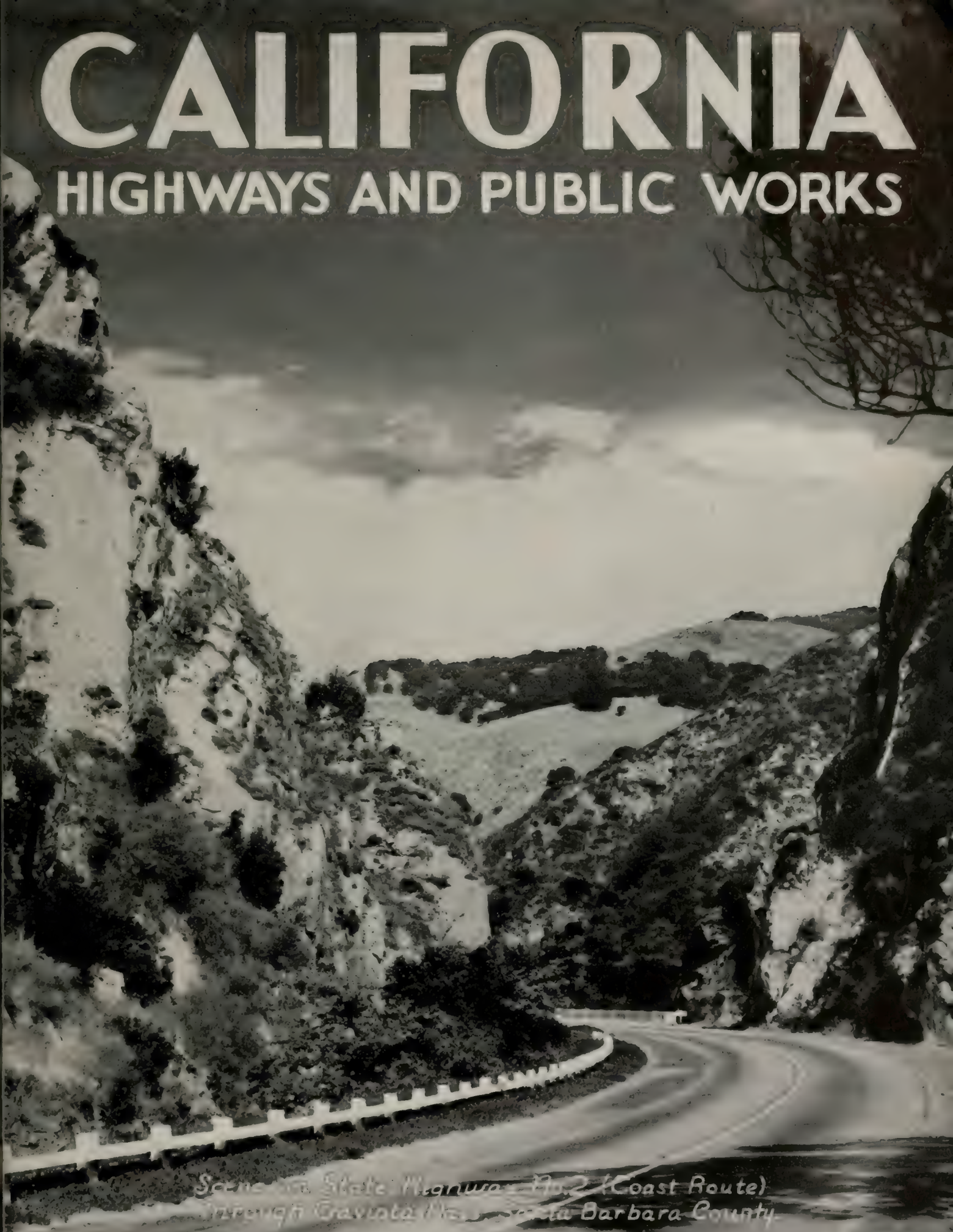
HIGHWAYS AND PUBLIC WORKS



Scenic State Highway No. 2 (Coast Route)
through Gaviota Pass, Santa Barbara County

Official Journal of the Department of Public Works

JANUARY • 1936

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Governor Merriam Announces

Public Works Program Providing for

28,000,000 Man Hours Work

During the Next Eighteen Months

By **FRANK F. MERRIAM,** Governor of California

LOOKING forward in this opening month of the year 1936 at the prospects for relieving the unemployment situation in California while securing important construction and improvement benefits for the State, I am greatly heartened by the report of Director Earl Lee Kelly of the Department of Public Works detailing the program of work planned by the three divisions of that department for the remaining months of the current biennium.

The activities of the Highway, Architecture and Water Resources divisions touch more closely, perhaps, the daily lives of our people than any other units of our State government. They are engaged in the construction and development of great public works for which the State and Federal governments apportion millions of dollars for expenditures within the State, thereby providing work and pay rolls for many thousands of our citizens.

GOVERNOR FRANK F. MERRIAM

It gives me great joy to be able to announce from the information in Mr. Kelly's report that the program of the Department of Public Works for which money may be anticipated under the present financial set-up of State and Federal funds will provide a total of approximately 28,000,000 man hours work during the remaining 18-month period of the current biennium, extending from January 1, 1936, to June 30, 1937.

This figure includes 10,000,000 man hours of work that the engineers estimate will be afforded by the Central Valley Water Project being constructed under the supervision of the U. S. Bureau of Reclamation.

From the Division of Highways, however, will come the largest share of the work that will be done by the State with State and Federal funds during the remainder of this biennial period. The development of California's State highways to high engineering standards which provide adequate facilities for the ever increasing volume of traffic is the earnest desire of my administration.

Substantial progress toward such development has been accomplished during the past year and the State highway organization is continuing into the new year the advancement of construction programs as established by the California Highway Commission's budget and the Federal unemployment relief allocations made to California for highway work.

(Continued on page 6)

JAN 25 1936

Governor Merriam Opens $994,000 Tower Bridge at M Street, Sacramento

UNEXCELLED for its architectural and engineering beauty and constituting an impressive western gateway to the Capital City, the unique and imposing Tower Bridge spanning the Sacramento River from the foot of M Street in the city of Sacramento formally was dedicated and opened to traffic by Governor Frank F. Merriam on the afternoon of Sunday, December 15, 1935.

Constructed at a cost of $994,000, the new structure, the only vertical lift span bridge on the California Highway System, replaces the old steel swing span built by the Sacramento Northern Railway in 1910. During the twenty-five years that the original M street bridge was in use, Sacramento's population expanded from 45,000 to approximately 100,000 and traffic increased 700 per cent in volume and 500 per cent in speed, making the old bridge with its nine-foot roadway cantilevered out from the trusses on either side of the structure not only entirely inadequate, but dangerous as well.

A COOPERATIVE PROJECT

The Tower Bridge, built by the State Department of Public Works in cooperation with the city and county of Sacramento and the Federal government, is 737 feet long, has a fifty-two foot roadway and two sidewalks, a thirteen-foot roadway in the center for the tracks of the Sacramento Northern Railway and two lanes for one-way traffic on each side of the tracks. Representing all that is modern in engineering skill, it will stand as an enduring monument to transportation progress and relieve traffic problems that had become a matter of grave concern to the state as well as to the city and the county of Sacramento.

Construction work on the Tower Bridge began in July, 1934, and was hailed by Sacramento and Yolo counties as the beginning of a new and greater bond between them.

At the outset, a problem of paramount importance that confronted Director Earl Lee Kelly of the State Department of Public Works, his engineers and the bridge contractors was that of detouring. The old M street bridge, built by the Sacramento Northern Railroad, carried a fifty-year franchise. It was necessary to provide not only for highway traffic but for a river crossing for the railway while the Tower Bridge was in course of construction.

After considering all feasible plans, the State spent approximately $12,000 in widening certain parts of the I Street Bridge to accommodate automobile traffic and built a temporary detour bridge about seventy-five feet north of the Tower Bridge to take care of the Sacramento Northern. This structure, built entirely of timbers with the exception of four spans of steel girders, rented for the purpose, cost $90,000.

Economizing to the utmost, the engineers made the grade of the detour bridge as low as possible, placing the steel girders just above normal high water. Exceptional rains last winter raised the Sacramento river to a point where, for a few days, driftwood endangered the temporary bridge, but this danger passed and there was no delay to railway traffic.

The Tower Bridge consists of a combination of steel and concrete spans. The central lift span is a 209 foot truss supported by two vertical towers 160 feet high. The approach span on the east consists of one 167 foot steel truss span and one 30 foot girder span. On the west, there is one 193 foot steel truss span and four 34 foot girder spans.

LIFT SPAN COUNTERWEIGHTED

The central lift span in its extreme high position has a clearance of 100 feet above high water and a horizontal clearance of 172 feet between the fenders. The total load of the lift span proper is estimated at 2,300,000 pounds. To avoid the necessity of lifting this great weight as a direct load, it is counterweighted by steel frames, filled with concrete. One of these frames is in each tower. They move in a direction opposite from that which the span moves. In raising the span, therefore, only enough electric energy is required to overcome the friction of the moving parts.

(Continued on page 12)

TOWER BRIDGE DEDICATION SCENES—A view of the narrow old M Street swing span structure contrasts with several views of the modern new Tower Bridge with central vertical lift span that replaces it. The view of the dedication day crowd shows the lift span raised. In the official group, left to right, are: Director of Public Works Earl Lee Kelly; Mayor Ferguson; Governor Merriam; Assemblyman Desmond; President McCurry, Chamber of Commerce; Assemblyman Nielsen; Commander Kunz, American Legion; Secretary Dudley, Chamber of Commerce. Governor Merriam is shown releasing one of a thousand pigeons carrying messages to mayors of California.

Highway Completed Through Historic San Marcos Pass on New Alignment

By **L. E. McDOUGAL,** District Office Engineer

ON a dismal rainy Christmas Day 89 years ago General Fremont led a small band of sturdy soldiers through the San Marcos Pass and pushed down the rugged brush-covered slopes of the Santa Ynez Mountains and captured the then small mission settlement of Santa Barbara.

This attack from over the mountains completely surprised the Spanish defenders who lay in ambush some 35 miles westward in the picturesque Gaviota Gorge with the intention of waylaying and destroying the attackers.

Were Fremont and his men to reappear at San Marcos Pass today, they would find, for their convenience, a modern oil surfaced highway carved for 5.8 miles out of the westerly slope of the Santa Ynez Range and dropping down almost into their objective, the city of Santa Barbara.

OVER SANTA YNEZ RANGE

The San Marcos Pass Road (State Route 80) was taken into the State system in 1931 and extends northerly from the Coast Highway at a point about two and one-half miles westerly from Santa Barbara. The old road, which ascended the Santa Ynez Range up a sharp ridge, was steep, very crooked, and had several dangerous hairpin turns. The road crosses the summit through the San Marcos Pass and thence generally follows down the Santa Ynez Valley through the towns of Santa Ynez and Los Olivos, rejoining the State Highway at Zaca, about 50 miles north of Santa Barbara.

This route is some 10 miles shorter than the regular main highway and provides an attractive alternate for the motorist, as the road traverses a truly delightful country. As one descends the mountains back of Santa Barbara, a beautiful panorama unfolds, embracing the city, the Santa Barbara Channel and the distant islands of the same name; and in the wooded canyons immediately adjacent are spotted numerous summer homes and cottages.

Extensive use of the road as an alternate route has been impeded mainly by the tortorous and dangerous condition presented by the old route up to the San Marcos Pass from the vicinity of Santa Barbara.

As soon as possible after the inclusion of the route in the State system, plans were formulated whereby the San Marcos Grade and other portions of the road could be brought to more modern standards and eliminate the dangers prevalent along the old route.

With this in mind, $500,000 was allocated for expenditure during the past biennium for the relocation of the highway from Santa Barbara to a point near the summit; and so, for the past year or more, power shovels and huge scrapers have been gnawing away at the sidehill overlooking Santa Barbara; and have excavated nearly 1,000,000 cubic yards of material and placed it in the adjoining gigantic fills.

The new road is a complete realignment from the old, and situated some distance easterly, has its junction with the Coast Highway about one and one-half miles closer to Santa Barbara than the old road; close to the intersection of the recently completed Santa Barbara Through Traffic Boulevard.

HEAVY GRADING A FEATURE

The new road is of 24-foot roadbed width and the maximum grade is 6.6% with a ruling grade of about 5% in the mountainous section. Surfacing for the present will consist of local material oil mixed and sealed 20 feet wide.

A feature of the work, aside from the heavy grading, was the constructing of large box culverts and placing of large drainage pipes at almost inaccessible locations far up the side of the mountain range. Rough temporary roads had to be bulldozed along the line ahead of the regular grading in order that the culvert materials might be transported to the drainage site.

Also, in conjunction with the project, there has been constructed across San Antonio Creek a combination timber and concrete bridge, 192 feet long, with a 24-foot clear roadway and consisting of eight standard 19-foot timber spans and one 40-foot concrete and steel girder span. Three large reinforced concrete arch culverts were constructed, the larger having 102 square feet of opening at Maria Ygnacio Creek.

(Continued on page 16)

SAN MARCOS PASS highway just completed on new alignment over the Santa Ynez mountains.

HEAVY SIDE HILL CUT one of several that permitted elimination of hairpin turns and steep grades.

CONSTRUCTION SCENE showing character of heavy grading work on fill leading to two 100 foot cuts.

Financial Set-up Provides $21,914,000

(Continued from page 1)

Provision for major construction in the sum of $21,545,400 was made in the revised biennial budget for the Division of Highways which received my approval on September 12, last. This budget was aimed to provide for continued development of the State Highway System, even with the curtailment of the State's share of gas tax revenue to one and one-half cents as a result of the granting of a second one-quarter cent to incorporated cities.

Since the approval of the budget, the Commission, due to increased gas tax revenue, has been able to raise the major construction allocation by some $1,913,100, making a construction budget total of approximately $23,458,500 from State and regular Federal aid funds for the period from July 1, 1935, to June 30, 1937.

In addition to this amount, Works Progress Administration funds for highway construction and grade crossing elimination in the amount of $15,234,290 were apportioned to California by the Federal Government, $7,747,428 being provided for road work and $7,486,362 for grade crossing elimination.

SIX MONTHS RECORD

Of the $21,232,300 in construction work orders issued by the Division of Highways during the last six months of 1935, some $6,923,500 provided for work budgeted under the revised State Highway program, $9,855,100 provided for work authorized under the two Works Progress programs, and $4,453,700 in work was financed from minor improvement, maintenance and previous biennium funds.

The $9,855,100 in projects put under way from the $15,234,290 in Federal funds allocated to California from Works Program Highway and Works Program Grade Crossing funds, leaves some $5,379,000 for unemployment relief contracts still to be advertised and awarded in the coming months of 1936.

From the Division of Highways budget, prepared upon the basis of estimated revenues from the State gas tax and motor vehicle license fees and from regular Federal Aid provided by Congress, the work put under way during the past six months in the sum of $6,923,500 leaves a balance of $16,535,000 in major project construction for the remaining eighteen months of the biennium.

FUTURE WORK FUNDS

The sum of these two balances provides for future work in the amount of approximately $21,914,000.

This amount of construction funds is contingent upon gas tax collections continuing at their present level and upon the appropriation by Congress of the regular Federal Aid funds. For the fiscal year ending June 30, 1937, California's share of Federal Aid is estimated at some $4,792,000.

While provision was made in the Hayden-Cartwright act of 1934 for the "1937 Federal Aid" funds, at the time of the passage of the bill Congress only appropriated sufficient money for the 1936 apportionment. The appropriation of funds for the 1937 apportionment has not yet been made by Congress.

In his message to Congress accompanying the budget, the President recommended that this Federal Aid appropriation be deferred one year. If such action be taken, it will mean that the major construction projects included in the regular State Highway budget will be reduced by some $4,792,000, leaving only about $11,743,000 for the programmed work during the remaining eighteen months of the biennium. Revision of the budget to meet such a reduction will of necessity eliminate approximately 25 per cent of the projects now programmed.

HIGHWAY MAN HOURS

Translated into hours of work the $21,914,000 anticipated for construction during the next year and a half will mean about 12,270,000 man hours for California labor. This total is obtained from 3,010,000 man hours on the Works Program projects and 9,260,000 man hours on the projects included in the revised budget.

Should the 1937 Federal Aid appropriation be withheld by Congress, it will mean the elimination of 2,684,000 man hours, leaving only 6,576,000 man hours for the budgeted program.

(Continued on page 13)

Major Highway Projects Planned for Construction in Next 18 Months

County	Location	Route	Miles	Amount	Type
Humboldt	Salmon Creek to Bucksport and Trinidad to McNeil	Redwood Highway	9.4	$290,000	Grade and surface
Mendocino	Outlet Creek to Reeves Creek and Eleven Oaks Road to Willits	Redwood Highway	5.3	256,000	Grade, surface and bridge
Del Norte	Between Winton Corner and State Line	Crescent City-Marshfield Road	5.1	140,000	Grade and surface
Tehama	Pacific Highway to 1.5 mi. East of Dales	Red Bluff-Susanville Lateral	13.8	175,000	Surface
	Richfield to Red Bluff	Pacific Highway (West Side)	13.0	270,000	Grade and pave
Shasta	Near Shasta to near Redding	Trinity Lateral	5.0	220,000	Grade and surface
Yolo, Colusa	Dunnigan to Arbuckle	Pacific Highway (West Side)	8.9	180,000	Grade and surface
Yolo	Causeway to "M" Street Subway	Sacramento-San Francisco Rd.	3.5	170,000	Grade and pave
El Dorado	Kyburz to Strawberry	Placerville-Tahoe Road	9.0	115,000	Surface
Santa Cruz	Scott Valley to Santa Cruz	Los Gatos-Santa Cruz Road	3.9	220,000	Grade and surface
Santa Clara	Alviso Road to San Jose	Bay Shore Highway	3.7	425,000	Grade and pave and bridge
Marin	Waldo to Golden Gate Bridge	Golden Gate Bridge Approach	3.5	1,750,000	Grade, pave and structures
San Francisco, Alameda	Approaches to Bay Bridge	Bay Bridge Approaches	------	978,000	Grade, pave and structures
Contra Costa	Between Oakland and Walnut Creek	Oakland-Walnut Creek Road	------	325,000	Grade and surface
Monterey	Soledad to Gonzales	Coast Route	8.0	158,000	Grade and pave
Monterey	Bradley to 6 mi. South of San Ardo	Coast Route	6.8	335,000	Grade, pave and bridge
Santa Barbara	Tajiguas Creek to 1½ mi. W. Arroyo Hondo; Rincon Creek to Carpinteria; Richfield Tower to Santa Maria River; and Sheffield Drive to Olive Mill Road	Coast Route	7.9	503,000	Grade, pave and bridge
Fresno	Fresno to Ashlan Ave.	Valley Route	4.0	275,000	Grade and pave
Madera	Kelshaw to Coarsegold	Wawona Road	8.0	230,000	Grade and surface
Kern	Tehachapi to Mojave	Tehachapi Lateral (portions)	------	100,000	Grade and surface
Los Angeles	Scoville Ave. to Osborne Ave.	Foothill Boulevard	------	235,000	Grade, pave and bridge
Los Angeles, Ventura	Calabasas-Conejo Grade	Coast Route (portions)	------	200,000	Grade and pave
Ventura	Big Sycamore Creek Line Change and Oxnard to Hueneme Road	Roosevelt Highway	5.9	223,000	Grade, pave and bridge
Orange	Seal Beach to Newport Beach	Roosevelt Highway	10.3	150,000	Pavement
Los Angeles	N and O Sts. and Wilmington Blvd. to Alameda St.	Roosevelt Highway	1.5	150,000	Grade and pave
Los Angeles	Rio Hondo Bridge	Los Angeles-Pomona Lateral	------	160,000	Bridge
Los Angeles	Culver City to Centinella	Sepulveda Blvd.	1.2	85,000	Grade and pave
Orange	Gypsum Creek to East Boundary	Santa Ana Canyon Route	2.6	175,000	Grade, pave and bridges
Los Angeles	Los Angeles River Bridge and Approaches at Atlantic Blvd.	Alhambra-Long Beach Route	------	271,000	Bridge and pavement
Los Angeles	Rosemead Avenue	Pasadena-Long Beach Route (portions)	------	222,300	Grade and pavement
Los Angeles	Sepulveda Boulevard	Sepulveda Boulevard (portions)	------	195,800	Grade, pave and structures
San Bernardino	Santa Ana River to Redlands	Los Angeles-El Centro Route	5.5	111,000	Grade, pave and structures
San Bernardino	Mountain Pass to State Line	Los Angeles-Salt Lake Road	15.3	415,000	Grade and surface
San Bernardino	Colton to Waterman Ave.	Los Angeles-Redlands Road	1.9	330,000	Grade, pave and bridge
Riverside	North Boundary to Beaumont	Imperial Valley Route	1.5	77,000	Grade and pave
Riverside	West Boundary to Prado	Route 43	3.0	205,000	Grade and pave
Inyo	Big Pine to Keogh Hot Springs	Owens Valley Route	8.0	150,000	Grade and surface
Mono	2 mi. S. Rush Creek to 3 mi. S. Mono Inn	Owens Valley-Tahoe Route	7.5	125,000	Grade and surface
San Diego	Del Mar to Encinitas, Las Flores Underpass to San Mateo Creek and Santa Margarita Bridge	Coast Route	16.8	988,500	Grade, pave and bridge
Imperial	Holtville to Brawley	Route 187 (portions)	------	104,000	Surface
Imperial	Midway Wells to Calexico	Route 202 (portions)	------	100,000	Grade, surface and bridge

U. S. Road Chief Suggests Plan to Meet Problem of Safety on Highways

Increasing motor vehicle accidents on public highways, the necessity for preventive measures and all aspects of safety precautions designed to lessen the great loss of life featured addresses delivered by prominent speakers at the recent annual convention of American Association of State Highway Officials at Miami, Florida. An outstanding paper, "The Right to Pass—In Safety," presented by Thos. H. MacDonald, Chief, U. S. Bureau of Public Roads, is herewith reproduced in part.

By **THOS. H. MACDONALD,** Chief, U. S. Bureau of Public Roads

IN OUR ways and means of meeting the problems of safety of travel on the highway, we lag far behind the advance that has been made in dealing with similar problems of travel by rail and ship. This comparison applies to all aspects of the problem—the operating officials, the laws and enforcement organizations, and even the facilities themselves.

The perfecting of each of these factors through consistent effort and experience in meeting these problems results in the inevitable record for ships and railways. Certainly it would be possible to draw comparisons leading to the conclusion, and the subsequent excuse, that the conditions to be met are so different in highway transportation—some so exaggeratedly different—that a comparable degree of safety for our streets and highways is beyond any reasonable possibility.

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THOS. H. MACDONALD

Fortunately, we are not now in the dark as to many things which need to be done to increase highway safety. An evaluation of the present status of ways and means that, if given the opportunity, will advance the cause of highway safety, discloses a very definite foundation on which to proceed. * * *

Records of the Bureau of Census show that there was an increase in fatalities in 1934 over 1933 of 4738, and in 1934 total fatalities of 36,101. In the 95 cities of over 10,000 population the total fatalities in 1934 were 10,361, an increase of 918 over the previous year. The fatalities in these cities were 28.7 per cent of the total. It is evident, therefore, that if we are to better this record materially we must look to the smaller towns and the rural districts. * * *

With a background as to the need and method of securing the vital and necessary facts, including the number, kinds and results of major and minor disasters on our highways, on which to base corrective action, the problem becomes one of organization and administration plus public education.

A natural transportation safety program is essential—definite in character and fixed in the responsibility resting upon officials for its various phases. The principal criticism that can now be made is that in general we are not reducing to effective action what we know to be sound and are not carrying on adequate research to clear our blind spots in traffic control.

MacDonald Proposes Federal and State Safety Committees

(Continued from preceding page)

To bring a sound safety program into definite form and then to place it in effective operation in all its ramifications, is the only policy that carries any hope of progress. The remarkable advance in the attainment of industrial safety has rested upon a definite program and fixed responsibilities. In the public safety field the same general principle must be followed.

Until recently there have been only State laws giving authority to officials to operate in the safety field. Now limited authority has been reposed in the Interstate Commerce Commission to make rules and regulations applying to certain types of vehicles moving in interstate commerce. We will have, within a short time, then an entry into the field of traffic regulations in a moderate way by the Federal government. We must depend, however, for the major advance in the actual attainment of safer conditions on our streets and highways upon the States and their local subdivisions.

PLAN OF ORGANIZATION

Without any claim as to novelty, the following plan of organization necessary for effective administration is advanced. There would be two principal divisions in the major organization: First, Federal, and second, State. In turn, each of these divisions would consist of two branches. First, an official committee appointed by the Chief Executive, or through legislation, consisting of those elective or appointive officers who have the legal responsibility and authority to act in this field. The second very important branch would be an advisory committee on safety consisting of representatives of organizations and individuals who are now engaged in safety work.

The Federal official committee* should be headed by a cabinet officer and consist of the heads of those divisions or bureaus which have legal authority now to act upon matters directly related to transportation safety—in addition to the representatives of the Federal bureaus, the President of the American Association of Motor Vehicle Administrators and the President of the American Association of State Highway Officials.

The Federal advisory committee on transportation safety would include organizations such as the American Automobile Association, the National Safety Council and other groups which now are engaged in safety work.

OFFICIAL STATE COMMITTEES

The State official committee should be headed by the Motor Vehicle Administrator and there should be associated with him the heads of State departments who have legal responsibilities in this field, such as the chief highway executive, the superintendent of public education and the head of any State safety group.

The State advisory committee would be composed of the representatives of branches of national organizations and individuals who are now engaged in the safety field.

The functions of the official committees, State and Federal, would be to formulate regulations and policies and to administer these. The functions of the advisory committee would be to encourage and support the public officials and their law enforcement officers, to suggest regulations and legislation, to help secure and sustain these and to carry on a constant campaign of education in every possible form to the end that the public shall become safety conscious. The importance of these advisory committees can not be overemphasized. Unless the official groups, Federal and State, have the backing of an intelligent and vigorous support, their work can not be effective.

Such an organization can be put into effect on executive order and would make use of existing legal authority and organization which must in the end be responsible for results.

(Continued on page 16)

* Such a committee could very well be composed of representatives of the Interstate Commerce Commission, the Bureau of the Census, the Bureau of Navigation, the Bureau of Aeronautics, the Bureau of Public Roads and the Bureau of Standards; and the Presidents of the American Association of Motor Vehicle Administrators and of the American Association of State Highway Officials.

CONVENTION OF HIGHWAY OFFICIALS URGES PRESIDENT TO EFFECT SAFETY PROGRAM

The following resolution was adopted at the annual convention of the American Association of State Highway Officials at Miami, Florida, December 9, 1935:

"Whereas, Accidents on the public highways, and fatalities resulting therefrom have continued to increase, as evidenced by the published records for 1934; and

Whereas, These records indicate a condition seriously disturbing to the public mind, to the public officials administering the traffic regulations, to those engaged in promoting highway safety, to those responsible for the construction and maintenance of public highways and to the motor industry; and

Whereas, It is considered of the utmost importance not only from the humanitarian standpoint, but also from the point of view of efficient and satisfactory highway construction, maintenance and operation that every phase of the existing conditions be thoroughly examined and all possible immediate and related steps be taken to correct the present conditions; now, therefore, be it

Resolved, That the American Association of State Highway Officials urgently recommends that the Federal and State governments take prompt action to correlate the efforts of all public and civic agencies now engaged in highway accident prevention; and be it further

Resolved, That this association specifically recommends to the President of the United States and to the governors of the several states that they use their executive authority at once to appoint advisory groups and direct existing official agencies to effect the cooperative action necessary to accomplish the desired results."

Measuring Stability and Cohesion of Bituminous Paving Mixtures by Machines

By THOS. E. STANTON, Jr.* and F. N. HVEEM†

WHEN the first oil mixed road surfacing was constructed by the State of California in 1926, it marked the beginning of an inexpensive type of pavement which now carries millions of vehicles annually, and covers a vast mileage of primary and secondary highways in this and other western states.

The development of this type of surfacing has required that many problems be solved, and a full share of these has fallen to the testing and research laboratory of the Division of Highways.

In order to retain the fundamental low-cost feature of such construction, it is essential that, whenever possible, cheap local materials be utilized. It is poor economy, however, to use materials of questionable quality and thus incur an immediate high annual maintenance charge just to obtain extremely low first cost. Therefore, to insure stable, traffic-resistant construction and to discriminate between good and bad materials, it is necessary that there be suitable laboratory tests to determine quality prior to construction.

TESTING FOR STABILITY

One of the important properties of a bituminous pavement is that of stability. The term "stability" is intended to express that quality of bituminous pavements which tends to resist plastic deformation. Unstable pavements are those that corrugate or groove under the action of traffic. A pavement which ravels and disintegrates due to abrasion or which fails from water action may not be fundamentally unstable.

Though a number of laboratory machines have been designed for testing stability, most of such stability measuring devices were developed for testing mixtures of the sheet asphalt or asphaltic concrete type, in which the binding medium consists of a relatively hard asphaltic cement. The oil mix type of pavement, in which the binder is a fuel oil or liquid asphalt, does not show high stability values in testing machines which primarily measure the cohesion or tensile strength of the mixture.

NEW MACHINE NECESSARY

Samples of oil mix surfacing, which had been known to withstand traffic successfully, gave results so low in these testing machines as to be almost negligible when compared to standards considered acceptable for asphaltic mixtures.

Inasmuch as many of these oil roads had successfully carried automobile and truck traffic, it appeared reasonable that a proper stability test should record the superior qualities of the low cost road as well as of the harder type of asphaltic concrete mixtures, and, furthermore, the test should indicate higher stability for a stable oil mix road than for an inferior asphaltic concrete mixture which had proved to be unstable by waving and rutting under the action of traffic.

In analyzing the action responsible for this pavement distortion, it appears that the prime force is the weight of the vehicle. The vehicle tends to sink into the pavement surface, and when in motion pushes one side of the depression forward in front of the wheel. (Fig. 1.)

Presumably, in a perfectly uniform and homogeneous mixture, and with the vehicle traveling at a uniform rate, any wave or ripple thus formed should proceed ahead of the vehicle indefinitely, or at least for the complete length of the pavement.

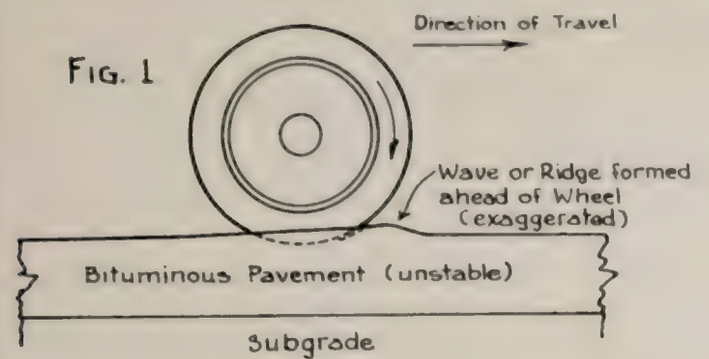
MOVEMENT OF SURFACE

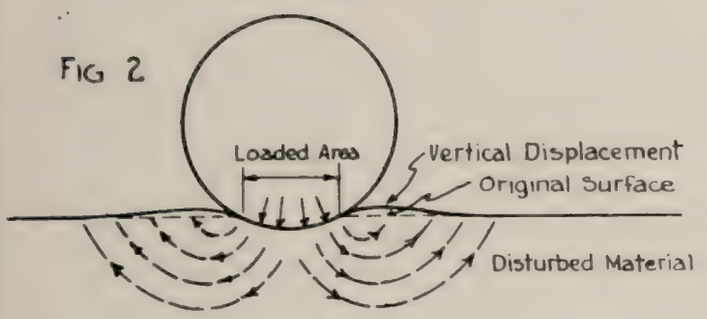
Bituminous pavements, however, are rarely of uniform quality, nor do vehicles proceed at uniform speed. Several factors probably contribute to the formation of transverse waves or ripples which may become quite extensive and of considerable magnitude under certain conditions.

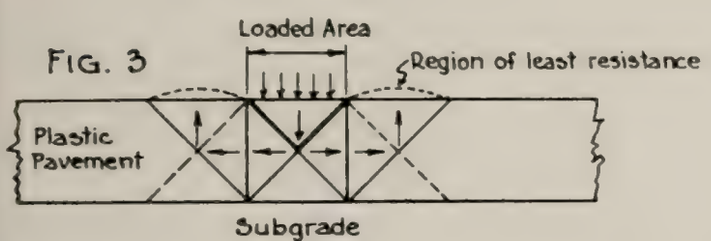
Figure 1 shows a diagram of a pavement surface, with a loaded wheel displacing a small wave or ridge in the direction of travel.

Figure 2 is a diagram illustrating the type of movement within the mass of the pavement under load. These lines of flow have

* Materials and Research Engineer, California Division of Highways.
† Associate Physical Testing Engineer, California Division of Highways.







been photographed and demonstrated experimentally.‡ There is ample evidence, both experimental and theoretical, that the effect of a load on a plastic surface is to force downward a conelike or wedge-shaped body of the material.

CAUSE OF UPHEAVAL

From a study of the diagram, Figure 3, it is evident that distortion or flow in a plastic solid in which the loaded area covers only a small portion of the exposed upper surface consists of a cone-shaped mass of the material being forced downward, meeting the resistance of an adequate support (subgrade) and the resultant forces are diverted horizontally and radially against the surrounding mass outside the loaded area.

The lines of least resistance naturally trend upward toward the unloaded surface surrounding the loaded area, so that when the load exceeds the resistance of the plastic solid, an upheaval occurs around the loaded area.

In producing the movement thus described, work is done principally in overcoming friction between the solid particles of the mass, and partially in overcoming adhesion in certain areas. (This last resistance varies with the speed of action.) The pressure horizontally transmitted to the side limits of the prism beneath the load will be less per unit area than the load pressure applied, so long as any internal friction exists.

MEASURE OF STABILITY

In other words, asphaltic paving mixtures may be classed as plastic solids; hence, a measure of resistance to plastic deformation should be a measure of stability.

The necessity for reliable laboratory tests to determine in advance the probable tendency of the pavement to shove and distort under traffic led to the development in the Materials and Research Department of the California Division of Highways of the special equipment hereinafter described.

‡ Part II, Proceedings of the Fourteenth Annual Meeting of the Highway Research Board, page 140.

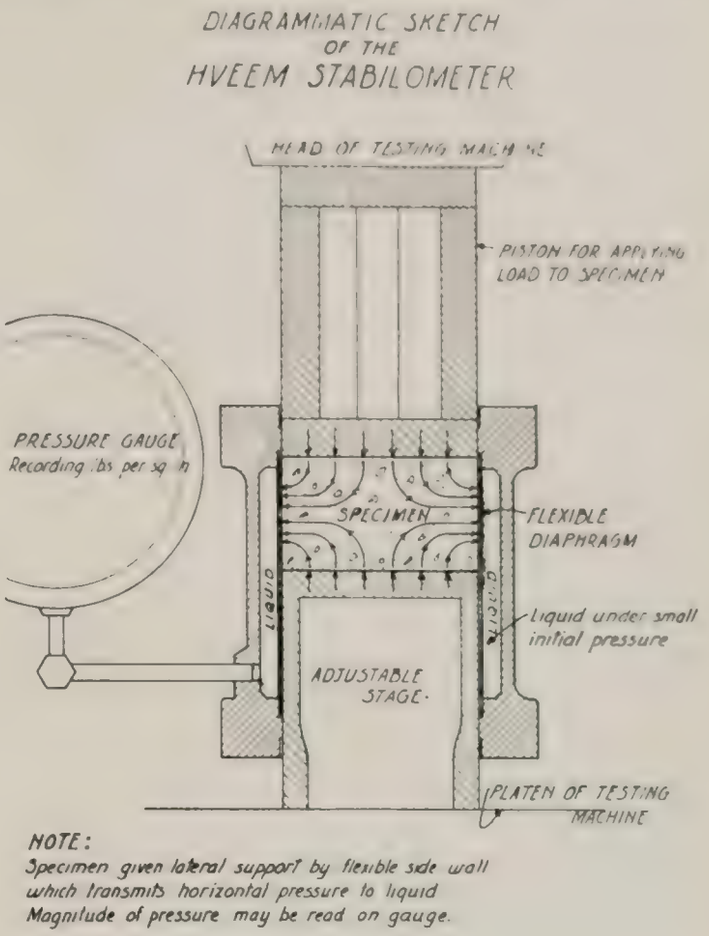


Fig. 5

HVEEM STABILOMETER as it looks completely assembled.

The stabilometer is a form of plastometer, and consists essentially of an outer metal shell of cylindrical form within which is secured a rubber tube of smaller diameter. The rubber is clamped to the cylinder at each end in such a manner as to form a water-tight chamber between the outside of the rubber tube and the inner side of the metal cylinder. This water-tight chamber is filled with any suitable liquid, and connected with a pressure gauge to register the pressure to which the liquid is subjected. (See Fig. 5.)

A compacted test specimen is formed to fit snugly within the rubber tube, and any lateral expansion of

(Continued on page 23)

Lift Span Moving Load, 5,000,000 Lbs.

(Continued from page 2)

The pull of the counterweights is attached to the four corners of the lift span by ninety-six steel wire ropes, twenty-four of them at each corner. Each rope is two inches in diameter. As the combined weight of the two counterweights equals that of the lift span, the total moving load, including the span counterweights, the wire rope cables and the fittings, is about 5,000,000 pounds.

When a river vessel passes through the span it is necessary for the operator to judge the height of the craft and then raise the span sufficiently to provide a suitable margin of safety above the highest point of the boat. An advantage of this type of movable span is that it is not necessary to fully open the span except for a few vessels. Immediately after the passage of a boat, the span is lowered and roadway traffic can be resumed.

OPERATED BY ELECTRICITY

A complex electrical system for operating the span was installed at a cost of about $100,000. The power for controlling the huge span and operating and lighting it is provided by an electric current taken on to the bridge by cable. The voltage is reduced for light and control purposes by means of transformers in the control house. Switches for all purposes are on switchboards and control desks in the control house.

When an approaching vessel signals for passageway it is answered from the bridge by an electrically operated signal. Automatic signals immediately are set to stop all approaching trains and derail switches are set to stop any trains that might overrun the stop signals. When this is done, it is possible to unlock the rail locks on the bridge and energize the control desk for operating the span. Sirens at each end of the bridge sound immediately, stop signals used at street intersections are lighted at both ends of the structure and bells and illumined signs warn traffic the span is about to open. The vehicular and pedestrian gates close automatically and sirens blow continuously until the gates are closed.

EIGHT SAFETY GATES

There are eight such gates and when the last is closed it is possible to raise the central lift span. When the vessel has passed the bridge operation is reversed and traffic resumed.

The new bridge can be fully opened or closed in approximately one and one-half minutes. Highway traffic will be stopped for only a small part of the time that was required for opening and closing the old bridge swing span.

The two great towers of the bridge rest upon two concrete cylinders built to a depth of fifty feet below water. In building the piers, two circular wells of timber sheet piling, each thirty feet in diameter, were driven into the river bed, sixty feet of piling having been used to provide safe freeboard above low water. After the cofferdams were completed, excavation with a clamshell bucket handled from a crane on a floating barge was undertaken.

The bottoms of the cofferdams were sealed by pouring concrete through a flexible pipe, reaching down into the water near the point of deposit. It was necessary to pour a sufficient amount of concrete inside the cofferdams to offset the hydrostatic pressure from the water outside. This required a seal twenty-four feet thick—about 650 yards of concrete—for each well.

The concrete in the piers, caps, paving, railings and walls amounted to more than 5,000 cubic yards. A total of 6,500,000 pounds of steel was required. Fifty-eight thousand feet of fir went into the 922 piles, varying in length from fifty to ninety feet. Excavation for the bridge and roadways totaled 23,000 cubic yards.

In excavating for the abutment on the Sacramento shore twenty feet below the present street level, the contractor discovered and removed complete sections of the Central Pacific Railroad laid there seventy years ago. There are 4600 lineal feet of concrete pilings in the bridge.

One of the chief hindrances to motor vehicle and pedestrian traffic on the old bridge was caused by switching trains on Front Street at the east end of the structure. There were several railroad tracks to be crossed at this point. The Southern Pacific, in a spirit of cooperation, has eliminated one track and Front Street has been repaved thus providing a smooth and easy crossing for highway traffic.

WIDE, EASY APPROACHES

Highway curves on the west approach have been eased off and pavement widened to connect with the Tower Bridge. The Sacramento Northern has rearranged its freight switching movements over the bridge so as to facilitate highway traffic.

Formal dedication of the bridge by Governor Merriam on December 15, last year, was witnessed by thousands of Sacramentans and visitors from other counties. The ceremonies began at 1.30 p.m. when the state's executive led a parade from Ninth and M streets to the bridge.

The procession was headed by bearers of the national and American Legion colors, commanders of Sacramento American Legion posts and the American Legion band. Automobiles bearing Governor Merriam and Director of Public Works Kelly, under whose supervision the bridge was built, followed. Behind them came cars bearing state, city and county officials and leaders of local civic bodies and citizens escorted by a drum corps. The dedication and opening of the bridge were arranged by the Sacramento Chamber of Commerce through a committee of which R. L. Moore was the chairman.

SPEAKERS ON PROGRAM

The celebration at the bridge began at 2 p.m. with flag raising ceremonies participated in by the Boy Scouts. Following rendition of "The Star Spangled Banner" by the American Legion Band, opening remarks were made by M. B. Kunz, commander of the American Legion city council. Brief talks were made by Mayor Arthur Ferguson of Sacramento; H. J. McCurry, president of the Sacramento Chamber of Commerce; John Keema, chairman of the Sacramento

MAINTENANCE ENGINEER GIVES TIMELY AID TO MOTORISTS IN ACCIDENT

MUTUAL CREDIT FOUNDATION
RIALTO BUILDING
San Francisco, California

Chairman Highway Commission,
Sacramento, California.

Dear Sir:

On September 17, 1935, at about 9 a.m., the writer had the misfortune to become involved in an automobile accident at a point just opposite the Point Sur Lighthouse and just north of the schoolhouse on that road. Only the writer's car was involved; it having turned over once on its top and settled on its left side facing south. The writer crawled out through a window and pulled out two other occupants, the instant the car had settled; however, the danger of fire was averted by the ignition key having been pushed in.

I wish to especially commend to you and your good service Mr. Brown, your District Maintenance Engineer, who was heading north and stopped his car picking all three of us up and proceeding without delay to the Peninsular Community Hospital at Carmel where he awaited the arrival of a doctor. He then proceeded to Carmel proper and left word with the garage there to proceed to the scene of the accident with a tow car giving them all necessary details.

While probably anyone else would have done the same thing, yet Mr. Brown's attitude was helpful, sympathetic and understanding and had the effect of calming us all down. In addition, he offered his services to any other extent we might need.

Kindly accept my sincerest thanks and may I ask that some official word be passed on to Mr. Brown as an expression of gratitude of myself and family.

Sincerely yours,

(Signed) Gilbert O. Roos.

GOVERNOR MERRIAM OPENS BRIDGE

(Continued from preceding page)

Board of Supervisors; William Russell, chairman of the Yolo County Board of Supervisors; George G. Pollock, general contractor for the bridge, and Director of Public Works Kelly.

Governor Merriam then formally dedicated the new bridge and entered his official car in which he led a parade across the great span. As the radiator of his automobile broke the ribbon stretched across the eastern bridge entrance, the siren on the central towers announced the opening of the structure to traffic and factory whistles throughout the city, automobile horns and sirens on river craft joined in the chorus.

Simultaneously, 1000 homing pigeons bearing tidings of the occasion to all sections of California were released.

State Water Plan Work to Approximate 10,000,000 Man Hours

(Continued from page 6)

An accompanying tabulation sets forth a few of the larger projects included in the work planned to be begun by the Division of Highways during the remainder of the biennium.

WATER RESOURCES PROGRAM

The Division of Water Resources will employ during the ensuing 18 months close to 200 technical and non-technical employees in the administration of water rights, water resources investigations, snow surveys, water master service, irrigation investigations, supervision of dams, cooperative stream gaging and topographic mapping, flood control construction, bank protection and the maintenance and operation of the Sacramento Flood Control Project, at an expenditure excluding materials and supplies, of approximately $600,000, representing roughly 840,000 man hours of employment.

In addition to the above, approximately 200 WPA relief workers will be employed intermittently during the ensuing 18 months under the direction of the Division of Water Resources on flood control construction and maintenance and operation of the Sacramento Flood Control Project, representing 468,000 man hours of employment at an expenditure of approximately $160,000.

CENTRAL VALLEY PROJECT

This does not include the Central Valley Water Project being constructed under the supervision of the United States Bureau of Reclamation on which an expenditure of approximately $15,000,000 is estimated during the next 18 months, including materials and supplies. It is not possible to accurately estimate the man hours on this project as it is not known when the peak employment will be reached, however indications are that it will provide approximately 10,000,000 man hours of employment.

The estimate for WPA relief work during the ensuing 18 months on flood control construction and maintenance and operation of the Sacramento Flood Control Project is made contingent upon relief work being carried out on this project on a comparable basis to that in effect in 1935.

(Continued on page 29)

Notable Highway and Bridge Project at Redding Completed and Dedicated

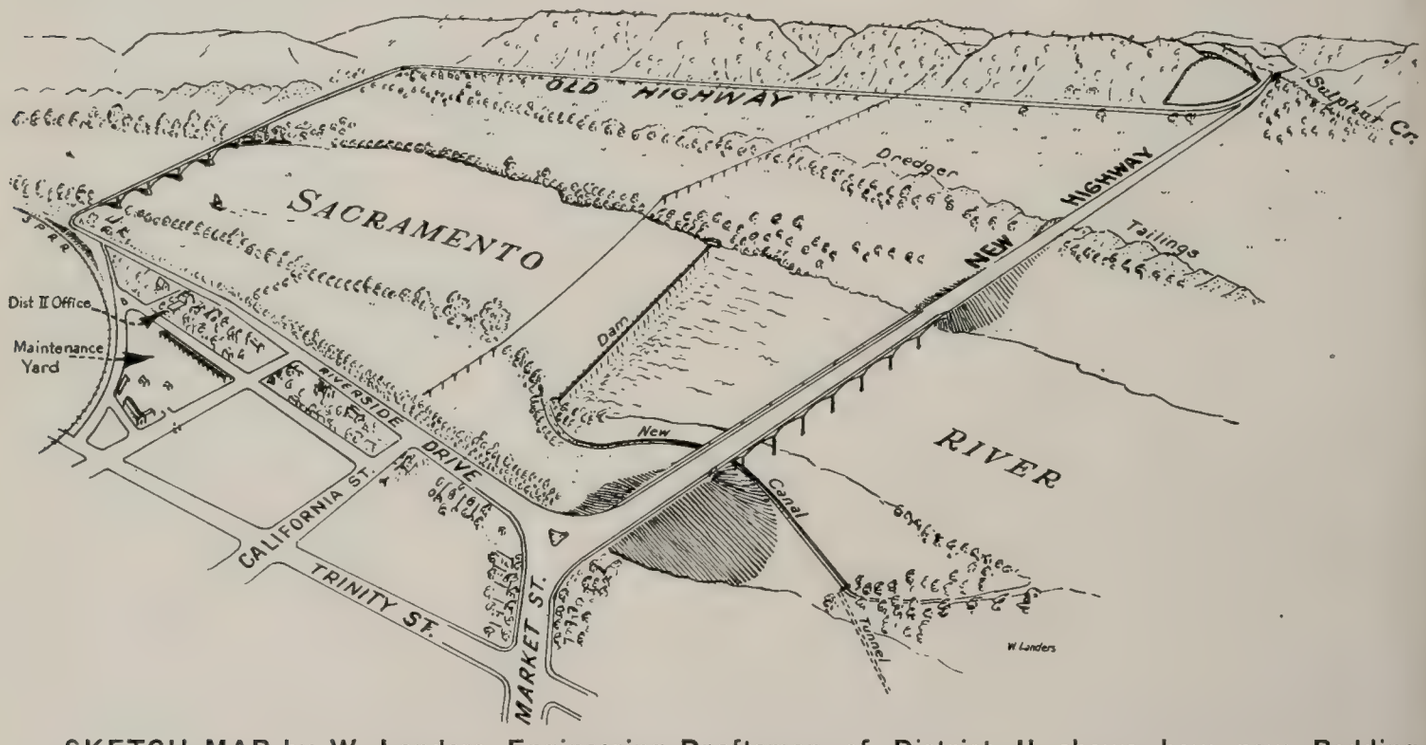
By **M. FREDERICKSON**, Resident Engineer

The new highway and Sacramento River bridge at the north entrance to the city of Redding was officially dedicated and opened to public use by the Director of Public Works, Earl Lee Kelly, on December 18, 1935.

The dedicatory ceremonies, participated in by public officials and civic leaders, were held on the south end of the new bridge spanning the Sacramento River, with President Harry E. Thompson, of the Redding Chamber of Commerce, presiding. Speeches were given and the traditional silken ribbon severed.

barrier that officially opened the road and bridge to public use.

This major improvement to the State highway system begins at the intersection of Market and Trinity streets in Redding and follows Market Street to the intersection of Riverside Drive. From this point, instead of turning left on a sharp curve to cross the Sacramento River more than one-half of a mile upstream, the new alignment turns slightly to the right and immediately crosses the river over a new bridge of modern design, and continues straight across the flat north of



SKETCH MAP by W. Landers, Engineering Draftsman of District II shows how new Redding Bridge across Sacramento shortens distance more than one mile.

Those participating in the exercises in addition to Director Kelly and President Thompson were: Mayor William Menzel, representing the city of Redding; G. T. McCoy, Assistant State Highway Engineer; F. W. Haselwood, District Engineer; F. W. Panhorst, Bridge Engineer; and Richard E. Wilson, Office Engineer.

RIBBON BARRIER CUT

Miss Barbara Hellesoe, daughter of Mr. and Mrs. G. F. Hellesoe of Redding, assisted Mr. Kelly in the final act of cutting the ribbon

the river to rejoin the existing highway near the Sulphur Creek Bridge.

SAVES OVER MILE

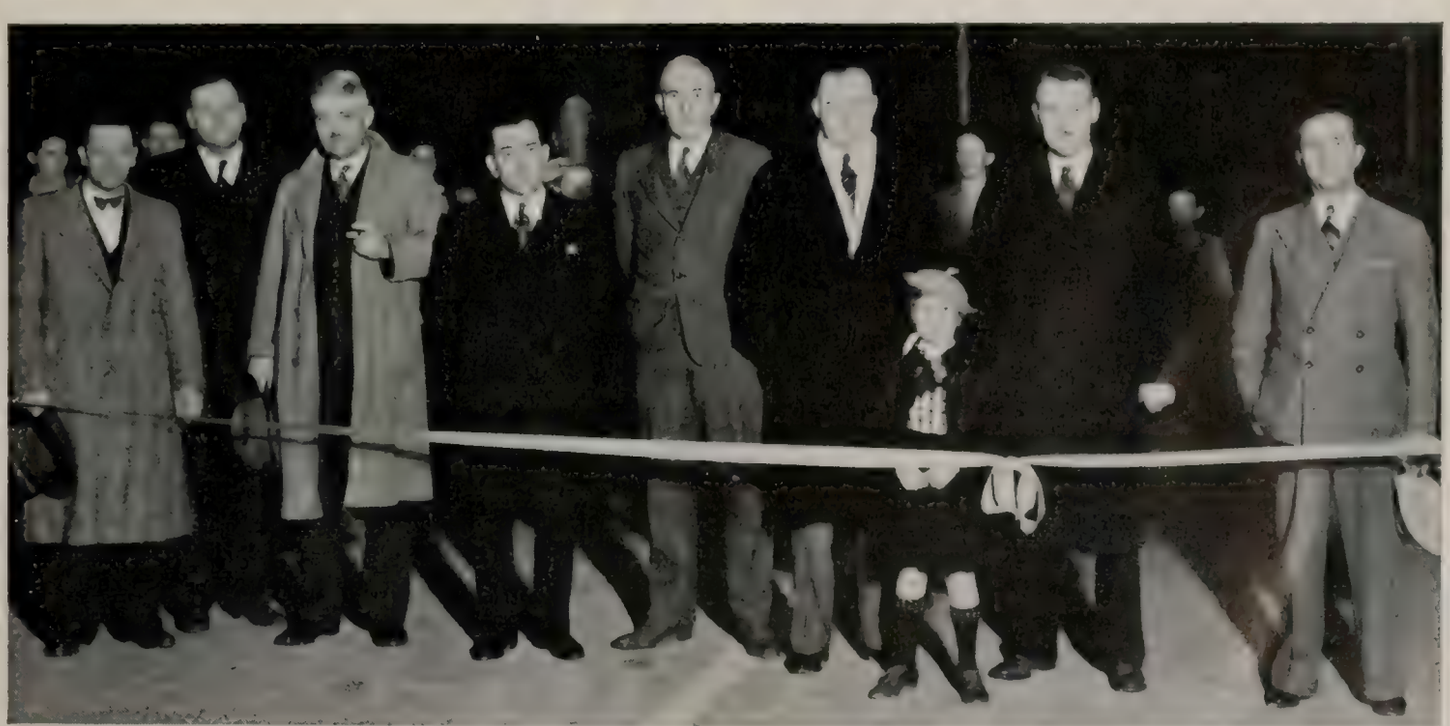
The entire length of the new road is 1.05 miles; whereas, the distance between the same limits over the old road was 2.2 miles.

The project has long been a dream in the minds of engineers, a cherished hope of the citizens of Redding and Shasta County, and the marked improvement in traffic service will benefit all who travel into or through that

(Continued on page 22)

STRAIGHT ACROSS THE SACRAMENTO at Redding goes the realigned State highway over a new 795-foot bridge with a 34-foot roadway and wide, easy approaches.

RIVER VIEW of the new steel girder type bridge consisting of six 108-foot continuous plate-girder spans and two 45-foot cantilever end spans on concrete piers.



OFFICIAL GROUP at night dedication ceremonies (left to right) Office Engineer R. H. Wilson, Division of Highways; District Construction Engineer, G. F. Hellesoe; Acting Bridge Engineer, F. W. Panhorst; Mayor W. B. Menzel of Redding; District Engineer F. W. Haselwood; Director of Public Works Earl Lee Kelly; Barbara Hellesoe who cut the ribbon; Assistant State Highway Engineer G. T. McCoy; President H. E. Thompson, Chamber of Commerce.

Highway Design for Safety Outlined

(Continued from page 9)

The first action would be to develop a detailed program and assign definitely the different activities proposed. We would then have for the first time a coordinated plan in which both State and Federal governments can function in harmony.

The same type of organization can well be extended into the city and major local subdivisions of government. * * *

The studies which the Bureau of Public Roads has made in cooperation with the highway departments and other agencies, and other studies, indicate a failure of around one-third of highway users to obey traffic signals.

The degree of disregard varies widely and this is not intended to convey the impression that one-third of the drivers on highways are careless or disobedient of regulations. Competent motor vehicle administrators place the percentage of really dangerous drivers as low as 5 per cent. The fact, however, that not more than 20 States have a highway patrol organization of even reasonably adequate character indicates the distance we have to go to establish law enforcement on our highways.

EMERGENCY HIGHWAY IMPROVEMENTS

In harmony with these suggestions but without delay there are two types of activities to which the highway departments should give greater attention. The first we may term the emergency improvements that may be undertaken quickly and that should prove effective in eliminating dangerous conditions. Such activities include placing of nonskid surfaces, the clearing of obstructions to lengthen sight distances, the elimination of hazard at points where accidents have occurred, if due to faults of the road, and the immediate marking of all curves for their safe speed of travel.

It is a fairly well established fact that the obvious danger points are not responsible for the greatest number of accidents. Where they are due to faults of road design, accidents usually result from some faulty detail not disclosed until too late.

For the long-time program, highway design must recognize the trend to higher speeds and provide for those to the extent they may reasonably be expected to become established by the public usage. This involves the recognition of two general classes of highways: those for through or main line traffic and those for local and tributary service. This classification follows the trend of public usage and human behavior. For the first class, ample width of traffic lanes, safe sight distances, easy curvature, superelevation, nonskid surfaces and clear vision of intersecting roads are essentials of proper design.

MULTIPLE LANE SEPARATION

Where multiple lanes are necessary it is recognized that in general the two opposing directions should be separated.

A serious fault existing in many otherwise high-class highways is the inclusion of short sections of highway in which the design as to curvature, sight distance or other details, falls below the general standard of the road. A very substantial contribution can be made by the highway engineering profession to the safety of highway use by adequately designing all component parts of the highway structure for safe travel, not only at the speed with which traffic moves at the present time, but in so far as possible for the speed which observation of the general trend indicates will be the average for the greater percentage of highway traffic in the years to come. Practically one-half of the fatal accidents are to pedestrians.

On these through highways, footpaths and sidewalks, which will actually be used by pedestrians, must be an integral part of the design.

Such elaboration of design necessary for those roads which fall into the general-use, long-distance, high-speed traffic class will be unnecessary for the tributary roads where traffic instinctively proceeds with less haste and more caution, and this distinction must be applied. Otherwise, the expense becomes too great a burden.

THE IMMEDIATE PROBLEM

In this discussion no attempt has been made to approach the subject from the angle of a traffic expert. The problem at this time is one of administration and organization. Such an approach will undoubtedly have the full support of the American Association of State Highway Officials because of their recognition, through their own experience, of its validity.

Unfortunately, because of the lack of organization, adequate administration and popular education in this field, much of the splendid effort and to an extent the great investment that has been made in highway improvement are being partially depreciated by the selfish and uncontrolled action of a relatively small percentage of the users of the highways.

Our highways are a proud possession. Over them each individual has the right to pass, but we must add the qualification, with due regard to the rights and safety of others.

HIGHWAY BUILT OVER HISTORIC SAN MARCOS PASS

(Continued from page 4)

It is expected that the road will be completed and opened some time this month and will afford the motorist a delightful and scenic alternative route when traveling the Coast Highway and certainly offers a striking contrast between riding along this modern road in the luxury of an automobile to that of not many years ago when a weary group of soldiers pushed their way down these same slopes through dense rain-soaked brush and mud.

State Highway Traffic Count to Be Made Monthly at 38 Key Stations

FOR several years it has been customary for the Division of Highways to make, on the Sunday and Monday nearest to the middle of the months of January and July, two 16-hour traffic counts at approximately 1400 traffic stations. This procedure is to be revised with respect to the winter traffic count. Instead of occupying 1400 stations on the Sunday and Monday nearest the middle of January, 38 stations will be occupied one Monday in each month throughout the year.

The most important reason for the change is that a monthly count at the smaller number of stations will effect a considerable saving in cost and at the same time furnish a more reliable basis for the estimation of seasonal traffic throughout the State.

MARKED SEASONAL FLUCTUATIONS

In the immediate vicinity of the larger cities the monthly fluctuation in volume of traffic is not pronounced, but it is marked in rural areas. There is also considerable range in fluctuation between different parts of the State.

The Redwood Highway (U. S. 101) in Del Norte County and U. S. 80 in Imperial County are typical of the extremes encountered in traffic fluctuation. In Del Norte County the traffic in July or August is approximately seven times as great as the traffic in January. On the other hand, July traffic at Fort Yuma approximates only 85 per cent of the January traffic. At Fort Yuma, peak traffic occurs during December and January.

Uncertainty of weather conditions in January was a secondary reason for the present revision of the traffic count. Over a period of years there is a fairly constant relationship between winter and summer counts made in a given locality. However, since rural traffic is greatly influenced by the weather, comparisons of winter counts limited to two successive years sometimes produce misleading results.

The monthly counts at a large majority of the 38 key stations listed below will be taken for 24 hours, the first count being made on January 13. Vehicles will be classified, as heretofore, by type and according to the number passing each hour. The records of these stations will be used in conjunction with the regular state-wide census which will be made in July.

LIST OF KEY STATIONS

ROUTE 1—Tiburon Junction, junction Routes 1 and 52. North of Ukiah, at junction with Route 15. Fernbridge, at junction with Route 56. Crescent City, at junction with Route 71.

ROUTE 2—Del Mar, at Santa Fe Railroad Crossing. Serra, at junction with Route 60. Los Angeles, at junction with Route 166 (Whittier Boulevard and Indiana Street). West of El Rio, at junction with Route 60. South of San Lucas, at junction with Route 10. Palo Alto, at Federal Telegraph Station.

ROUTE 3—12 Mile House, at junction with Folsom Road. North of Weed.

ROUTE 4—Tunnel Station, junction of Weldon Canyon and Tunnel Road (Junction Routes 4, 23, and 157). Famoso, at junction with Route 33. Califa, at junction with Route 32.

ROUTE 5—Mossdale, at junction with Route 66.

ROUTE 7—South of Williams.

ROUTE 8—Petaluma Creek Bridge.

ROUTE 9—Junction of Routes 9 and 190, Los Angeles County.

ROUTE 11—Isleton Bridge, junction of Routes 11 and 53. 14 Mile Post (Headquarters Camp).

ROUTE 12—Whitestar, west of Jacumba, at junction with Route 200. West of El Centro, at junction with Route 26.

ROUTE 23—3.25 miles south of Palmdale, at junction with county road. South of Lone Pine, at junction with Route 127. Leevining, at junction with Route 40.

ROUTE 26—Whitewater, at junction with Route 187.

ROUTE 28—East of Canby, at junction Malin-Klamath Falls Road.

ROUTE 29—3 miles west of Chester, at junction with Route 83.

ROUTE 31—Cajon, at junction with Swartout Valley Road (Route 59). Barstow, at junction with Route 58 at Mojave River.

ROUTE 43—Olive, at junction with Route 178. Mt. Anderson, at junction with Route 188.

ROUTE 55—Junction of Routes 55 and 56 (Salada Beach Road).

ROUTE 60—Junction of Routes 60 and 174 (Lincoln Boulevard and Manchester).

ROUTE 68—Burlingame, junction with Broadway.

ROUTE 72—Northeast of Weed.

ROUTE 77—Temecula, junction with Route 78.

"About this girl you want to marry—has she good connections?"

"Well, she never came apart when I was with her."

San Francisco-Oakland Bay Bridge Will be Opened to Traffic in 11 Months

ONLY eleven months more and the construction of the world's largest bridge will be California history.

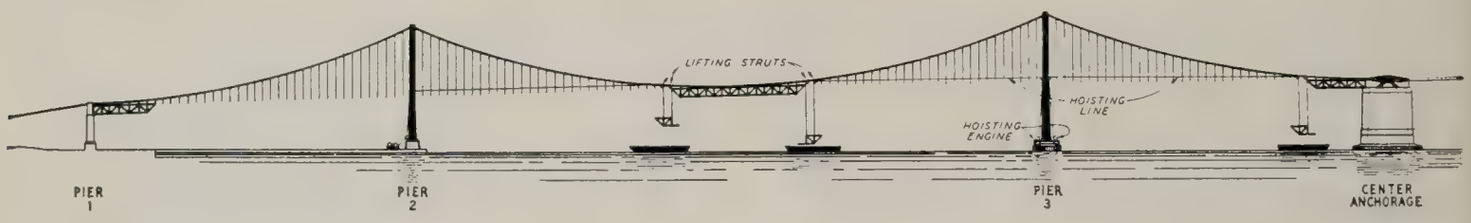
This is the essence of the 1936 New Year's Day report to Governor Frank F. Merriam, chairman of the California Toll Bridge Authority, by State Director of Public Works Earl Lee Kelly.

Despite the pace of the 30-hour week and the obstacles which nature places in the way when man seeks to set new engineering frontiers in defiance to the hazards of deep water and dizzy heights, the world's largest bridge will finish ahead of schedule. By November, 1936, Chief Engineer C. H. Purcell expects to have finished the paved decks so that the bridge may be opened to traffic during November.

these great bridges and California is the special beneficiary.

"The engineering wonders of these two record-breaking structures have turned the eyes of the world on America, on California, and on San Francisco Bay—just as Boulder Dam has turned the spotlight on Los Angeles. The State Department of Public Works is proud to present to California this San Francisco-Oakland Bay Bridge, which, eminent authorities have said, will hold its place as the greatest bridge in the world for one thousand years.

"During its first year we expect the bridge to carry 6,000,000 vehicles, and full prosperity only needs to return to give the bridge an annual passenger traffic of 50,000,000 persons."



FERRIED ON BARGES roadway trusses for the Bay Bridge are lifted from midbay into position and fastened to suspender cables as shown in sketch.

$40,000,000 EXPENDED TO DATE

Thus far approximately $40,000,000 has been expended on bridge and approaches. During 1936, the bridge and its approaches—representing $62,600,000 at present estimates—will have been completed and the remaining $15,000,000 worth of work which represents the cost of the interurban railway on the bridge will, if present negotiations with the railroads and RFC are successful, be well under way. The railway portion will not be completed until after the highway decks have been opened to the traveling public.

"The building of this world's greatest $77,600,000 bridge between San Francisco and Oakland," Director of Public Works Kelly said, "and its sister bridge, the $35,000,000 Golden Gate Structure, sets in motion the tidal wave of public interest in California which is to produce a tremendous exposition on a specially made island in San Francisco Bay in 1938. The entire west is tributary to

PROGRESS SCHEDULE FOR 1936

The report to Governor Merriam set forth the following schedules for completion of units of the San Francisco-Oakland Bay Bridge in 1936:

BERKELEY UNDERPASS—now complete.

EAST BAY DISTRIBUTION VIADUCTS—complete April 1.

MAINTENANCE BUILDINGS IN OAKLAND TIDELANDS—complete July 1.

EAST BAY BRIDGE—cantilever closed March 7.

PAVING EAST BAY—complete May 7.

YERBA BUENA ISLAND—upper deck of tunnel and all island work, including the tunnel—complete June 1.

WEST BAY BRIDGE—(The twin suspension bridges, East Bridge and West Bridge, over the West Bay Channel, between San Francisco and Yerba Buena Island)—The west bridge will be completed first, with all of its spans hung from the cables by March 15, and the steel floor in by April 15. The East Bridge, between the concrete center anchorage and the island, 28¾ inch cables for which are now being spun, will have its decks

(Continued on page 20)

FROM THE WATER UP go steel sections of the San Francisco-Oakland Bay Bridge roadway to be hung in position on suspender cables. These sections consist of about 90 feet of truss measuring the full 66-foot width of the bridge and weighing as much as 210 tons. They are ferried out to the bridge on barges as shown in the top photo and lifted into position by steel lifting lines operated by engines at the base of the towers as seen in the center picture. At bottom is shown one section just six feet below final position 250 feet above the Bay and in inset workmen are sliding down from the main cables to attach socketed suspender cables, four of which can be seen dangling over each end of the truss.

Bridge Deck Sections Hung from Cables

(Continued from page 18)

hung by June 15 and its floor steel in by July 15; and all paving in the West Bay will be complete by September 15.

SAN FRANCISCO APPROACHES—complete by July 1.

ENTIRE BRIDGE (exclusive of railways)—paved by September 15 and cleaned up ready for traffic by November, 1936.

Work completed in 1935 is listed as follows:

PROGRESS MADE IN 1935

EAST BAY. Five 504-foot through truss spans, east and west cantilever anchor arms, west cantilever arm, completed in 1935.

YERBA BUENA ISLAND. Three 300-foot deck truss spans over the east side of the island completed in 1935 together with towers supporting them. The vehicular tunnel through Yerba Buena Island was fully excavated and lined with concrete by the end of 1935 and construction of the upper deck started. At the beginning of 1935 the vehicular tunnel was in the stage where three small excavations (two at the bottom and one at the crown) had been bored through the wall and the concrete footings for part of the side walls poured.

Therefore, during 1935 it may be said that save for three pilot tunnels, entire excavation of the Yerba Buena Island tunnel was accomplished. In the category of concrete work, all but the footings for the side walls were poured during the year 1935—the footings having been laid in the fall of 1934. Similarly, all the concrete viaduct at the east portal of the tunnel, a section of the bridge approximately 800 feet long, was built during 1935.

SUPERSTRUCTURE COMPLETED

WEST BAY. At the start of 1935, the last of the foundation work was being done; some concrete was still being poured at Pier A near Beale Street, San Francisco; and the concrete center anchorage, a mile off the San Francisco shore, was being raised by the superstructure contractor to the height where it was to be taken over by the Columbia Steel Company for cable spinning. The superstructure contractor had erected Towers W-2, W-3, and W-6; and had raised W-5 to 155 feet with approximately 350 feet to go. The fenders for Pier W-4 and W-3 were not yet complete.

"MONEY WELL SPENT!" SAYS CHAIRMAN JONES OF RFC ON VISIT TO BAY BRIDGE

Jesse Jones, chairman of the Reconstruction Finance Corporation recently visited San Francisco to see for himself what is being done with the $61,000,000 Uncle Sam loaned to span the bay.

He asked not only to be told about the progress of the work on the San Francisco-Oakland Bay bridge, but the opportunity to see for himself—and got it!

Taken to Yerba Buena Island, he eagerly scaled the span catwalk, braving a lashing rain and tugging winds, and walked far out over the green waters.

A half hour later he descended and gazed at the great vehicular and train bore through the island, and exclaimed:

"That's what I call money well spent!"

He expressed surprise at the rapidity of construction, admiration for the engineering skill represented by the massive bridge works, and reiterated a previously expressed belief the span will pay for itself within 20 years.

After the catwalk visit, Jones was taken for an automobile ride on the completed concrete viaduct on the East Bay section of the bridge.

His hosts included Earl Lee Kelly, State Director of Public Works representing Governor Merriam; Leland W. Cutler, president of the exposition board and vice chairman of the financial advisory committee for the bridge, Charles H. Purcell, chief bridge engineer and Joseph A. Moore, State Harbor Commissioner.

Eyebars on both the San Francisco and Yerba Buena Island Anchorages had been set up and were practically ready for cable spinning, and locker posts at Pier W-1 on the Embarcadero and at Yerba Buena Island Anchorage were under way.

During 1935, catwalks on both the West Bridge and East Suspension Bridge were built and the spinning machinery erected. Spinning was completed during the year on the West Bridge between San Francisco and the Center Anchorage; and half completed on the East Bridge between the Center Anchorage and Yerba Buena Island. Cable bands were bolted around the suspension cables and the first sections of the actual decks of the bridge were being hung from the cables in the last month of 1935.

"MONEY WELL SPENT!" declared Chairman Jesse Jones of RFC viewing Bay Bridge progress from a swaying catwalk. Left to right are: Leland F. Cutler, Director Earl Lee Kelly, Chief Engineer C. H. Purcell, and Mr. Jones.

Bay Bridge Roadway Trusses Being Erected

(Continued from preceding page)

Two weeks before New Year's Day, January, 1935, the $835,000 field painting contract had been awarded, and half of this gigantic painting job was completed in 1935.

Contracts for construction of the Toll House and Maintenance Buildings were awarded in July, 1935, and are now well under way. Also, in July, 1935, the contract for the lighting of the bridge and electrical work was awarded and construction of the units is now going on.

Contract for the San Francisco Approach was let in January, 1935, and is now half complete.

In April, 1935, the contract for interlacing viaducts of the East Bay Distribution Structure in Emeryville was awarded and is half complete.

In June, 1935, the contract for the Folger Avenue Underpass in Berkeley was awarded and that contract is now complete.

In October, 1935, the contract for the San Pablo Underpass was awarded and is now in its early stage of construction.

The erection of the roadway trusses of the west suspension bridge started during December. Prior to that time all of the cable bands and suspenders were hung from the cables. In the meantime, the assembly yard at Islais Creek had been put in order. Here the sections of trusses are assembled somewhat like automobiles are put together on an assembly line. These sections consist of about ninety feet of truss the full 66-foot width of the bridge, and some weigh as much as 210 tons. When they reach the end of the assembly line they have been riveted up and ready to take their place in the bridge.

A barge is floated under the end sections. By pumping the water out of the hull, the barge rises and lifts the steel section free from its supports. The barge is then towed out to a position under the cables of the bridge.

From this point the truss section is lifted vertically and attached to the suspenders which are looped over the cable. This lifting is accomplished by engines placed at the base of the steel towers. The lifting lines from the engines are carried up about two-thirds the height of the tower and thence horizontally out to lifting struts which are securely fastened to the cables. From the lifting struts the lifting line is dropped down and attached to the truss.

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EARL LEE KELLY----------Director
JOHN W. HOWE----------Editor

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Vol. 14 JANUARY, 1936 No. I

GAS TAX DIVERSION

In their own interest the people must prevent the diversion of the gasoline tax money to other purposes than road building. The gasoline tax belongs to the roads and to the roads alone by original policy. It was levied originally on motorists for the purpose of providing good roads on which motorists could run. The purpose justified the tax and has kept it popular. If the money is diverted to any other purpose the tax is no longer justified.

This generation owes much to the invention of the gasoline tax. This excise has built two of the most important industries in the country. These are the petroleum and the automobile industries.

* * * * *

The chain of cause and effect is clear. The gasoline tax built and is building the roads. Good roads alone made possible the automobile for everybody. The automobile, by the demand it set up for gasoline, developed the petroleum industry to a pitch not dreamed of before.

* * * * *

The gasoline tax belongs to the roads. It is the motorists' money, cheerfully given up by them for the roads but NOT for any other purpose.

* * * * *

So far the people of California have vigilantly warded off every attempt to seize the gas tax money for other purposes than the roads. In an unguarded moment, however, the fund might be looted. It will be well to put a double lock on it by a constitutional ban on using it for any purpose but the roads.—*San Francisco Chronicle.*

New Redding Highway Bridge and Alignment Saves Mile in Travel

(Continued from page 14)

vast area of northern California and southern Oregon, appropriately known as the Shasta Cascade Wonderland.

Few State projects result as does this one, in a saving in distance equal to its length. The result will be a direct saving of many dollars in fuel cost alone to the traveling public. In addition to this monetary saving, the value of the increased driving safety and comfort which was brought about by the elimination of a hazardous stretch of road is incalculable.

BRIDGE 795 FEET LONG

The construction work was performed under two contracts: One, covering the major portion of the bridge, and the other, the approaches and end spans to the bridge.

The bridge, of continuous steel girder type, is 795 feet in length, has a driveway width of 34 feet and three feet sidewalks. The central and major part of the bridge, consisting of six 108 feet continuous plate-girder spans and two 45 feet cantilever end spans, on concrete piers, was constructed at a cost of approximately $180,000.

This work was started on July 5, 1934, and completed on April 2, 1935. A. L. Richardson was resident engineer on the bridge contract.

The approaches to the bridge, including the two 28½ feet end spans, were constructed at a cost of approximately $97,500. This work was started on February 23, 1935, and completed on December 17, 1935.

STREET WIDENED AND PAVED

A large item in this contract was the widening and repaving of a portion of Market Street in the city of Redding. The width of this portion was increased from 60 to 80 feet, and the roadway 56 feet wide was paved with Portland cement concrete.

The approaches to the bridge were constructed to a gross width of 50 feet and paved with a bituminous road-mix surfacing, 32 feet wide on the south approach to the bridge and 22 feet wide on the north approach.

Fingerprints have been urged as a requisite for obtaining a license to drive an automobile in California.

Stabilometer and Cohesiometer Built for Pavement Tests

(Continued from page 11)

the loaded test specimen transmits pressure to the liquid through the flexible rubber walls, the resulting lateral pressure being recorded by the test gauge.

DETAILS OF TEST

Laboratory test specimens may be prepared by tamping, compression, or any suitable means of compaction designed to give as nearly as possible the same efficiency of consolidation as is obtained from rolling or traffic. We have found that efficiency of consolidation is not always accurately indicated by density determinations.

Under the conditions of this test, a frictionless liquid specimen transmits lateral pressure equivalent to the applied load per unit area. A rigid solid transmits no lateral pressure. Lateral pressures of plastics or semisolids will, of course, range somewhere between the liquid and the solid.

For simplicity, stability results are reported in a scale ranging from 0 to 100 per cent, in which 0 equals a liquid condition, and 100 per cent is the equivalent of a solid with no measurable lateral reaction under the test loads employed.

APPLICATION TO PAVEMENTS

Correlation with pavements under traffic indicates that a stability value of 30 per cent to 35 per cent represents a bordering condition. In other words stability values of less than 30 per cent indicate a pavement which will to some degree displace under traffic, which mixtures showing stability values above 35 per cent have so far shown satisfactory service value. Traffic and local conditions vary sufficiently, however, to make precise comparison difficult.

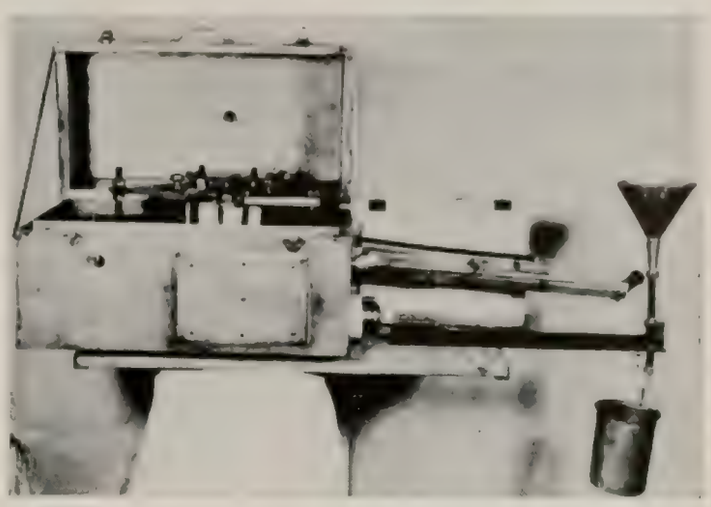
Stabilometer results are not consistently higher on mixtures using hard asphalt than on those using fuel oil or liquid asphalt. In order to measure differences which do exist between oil mix and asphaltic concrete pavements, an instrument was built to measure the tensile strength or cohesion of a compacted specimen. (See Fig. 6.)

The tensile strength of a bituminous pavement is, of course, due chiefly to the adhesion of the asphalt to the aggregate particles, and the cohesive strength of the bituminous film. While the quality is described as tensile strength for the sake of simplicity, it must be recognized that more precisely it is the rate of flow with time, and hence characteristic of the consistency of the bituminous binder, and also of the fineness, or surface area equivalent, of the aggregate.

TENSILE STRENGTH DIFFERENCES

It was found that the cohesiometer could measure definite and consistent differences between oils and asphalts of varying consistency. A given specimen with "D" grade asphalt may give as much as 50 times the "tensile" strength of a mix using fuel oil.

An attempt to correlate tensile strength values with



HVEEM COHESIOMETER for measuring tensile strength of bituminous pavement. Broken briquette is seen in center of box.

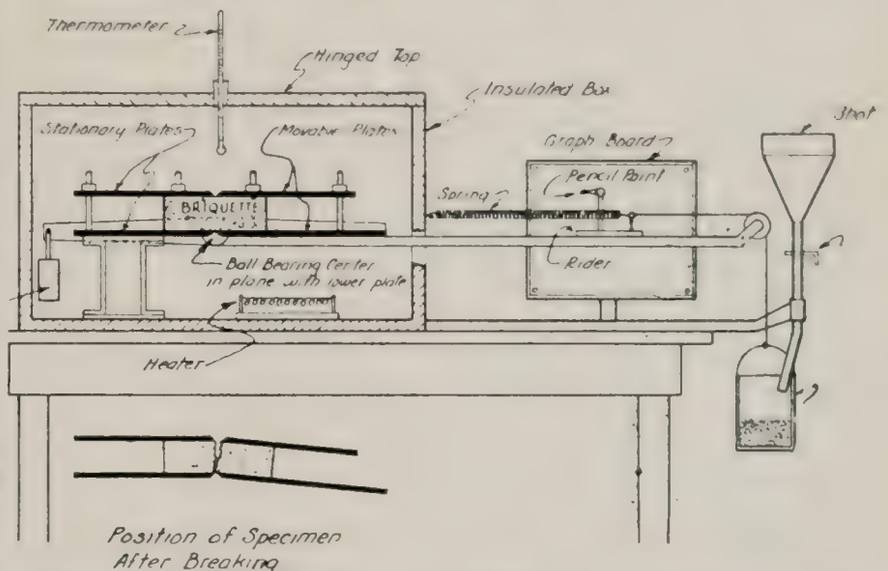
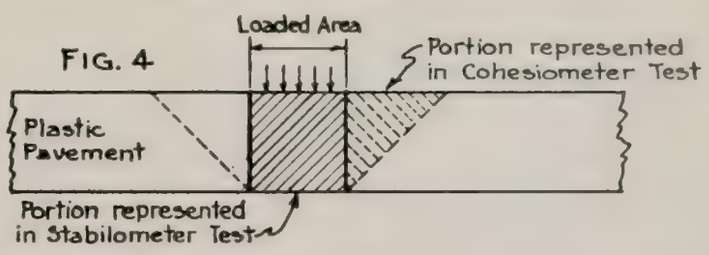


FIG. 6—DIAGRAM showing construction and operation of Hveem Cohesiometer.

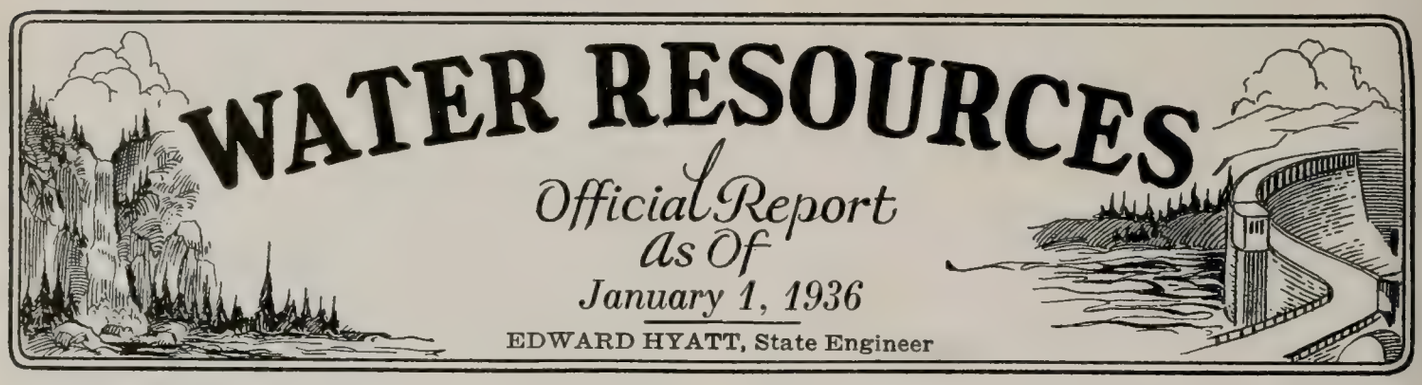


pavement performance shows very uncertain agreement. The fact that mixtures of very low tensile strength can and do remain smooth under traffic, and also that mixtures of quite high tensile strength have been known to become waved and rutted, is proof that this quality is not essential for the pavement to resist the distorting effects of vehicles, although it is true that if the pavement mixture is lubricated to such a degree that it has a tendency to distort, the time required for roughness to become evident will depend to a great degree on the tensile strength, or more precisely *the rate of flow of the bitumen* serving as binder.

FUNCTIONS OF MACHINES

The stabilometer measures the tendency of the portion of the pavement under load to expand or flow laterally against the surrounding pavement.

The cohesiometer measures the cohesion or chief property by which the surrounding pavement tends to restrain the lateral flow. (See Fig. 4.)



The Central Valley Project, one of the largest and most worthy undertakings for water conservation in the United States, plans for which have been formulated by the Water Resources Division of the Department of Public Works of California, is rapidly nearing the stage of actual construction. Under a new order issued by President Roosevelt, officially announced at Washington on December 10th, an initial allocation of $15,000,000 from the Emergency Relief Appropriation of 1935 has been authorized to begin construction of the project.

Detailed surveys are now being made by the Bureau of Reclamation in preparation for actual construction, and contract plans and specifications are being prepared by the Denver office. A board of consulting engineers consisting of Dr. W. F. Durand, Mr. Charles H. Paul and Mr. R. V. Meikle, in company with Dr. Charles P. Berkey, Consulting Geologist, and Mr. J. L. Savage, Chief Designing Engineer for the Bureau, have just completed a five-day field inspection and study of the project with respect to the plans and program for immediate construction. It is expected that initial contracts will be advertised for bids and construction will be actively under way early this year.

STATE IS COOPERATING

The Water Project Authority of the State of California is highly satisfied with the proposed program and the progress which is being made. The State Department of Public Works is cooperating in every possible way with the Bureau of Reclamation in speeding the work on the project.

The areas to be served by the Central Valley Project are National assets and the preservation of agricultural and industrial production in those areas and the social life dependent thereon and business created thereby is of National concern. It is a project of first and prime importance to the State of California.

IRRIGATION DISTRICTS

To date the Reconstruction Finance Corporation has authorized loans in the total amount of $35,686,401 to 37 California irrigation districts for refinancing an indebtedness of $63,778,993. Of the amount authorized, about $17,000,000 have been disbursed in refinancing over $30,000,000 of indebtedness. In addition to loans for refinancing, the R.F.C. has granted about $2,000,000 in loans to irrigation districts for improvements in their canal and distribution systems.

California Districts Securities Commission.

Among the matters which came before the Commission for consideration, the following were approved:

1. Petition of the Paradise Irrigation District for consent to new plan of debt readjustment and for authority for filing petition under the provisions of the Federal Bankruptcy Act.

2. Expenditures totaling $48,892 by the following irrigation districts, operating under Section 11 of the Securities Commission Act, were approved: Citrus Heights: Carmichael, West Side and San Dieguito districts.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

A crew of 20 men has been engaged in clearing brush from the Tisdale By-pass, to assist in the rectification of the channel at the westerly end of the by-pass.

Relief Labor Work.

Six relief labor projects are now in operation, on which 252 men are employed. The work being done consists of clearing and improving flood channels, most of the activity being in Sutter and Yuba counties. One project is operating in Yolo County, employing 35 men in the Sacramento By-pass.

Sacramento Flood Control Project.

This division has proceeded with the work of installing pipes and doing other incidental construction in connection with right of way for the south levee of the American River near Perkins. Construction was commenced on December 16th under contract with the California Debris Commission.

The Division is now working on the installation of pipes in four road crossings in the borrow pit on the

Three Levee Units to Be Constructed

(Continued from preceding page)

property of Burr Mitchell north of Colusa, and the crossings are being raised.

Good progress is being made in construction of three new drainage pumping plants in the Sutter Bypass, under contract with the California Debris Commission.

A conference was held December 4th between representatives of the State and the U. S. War Department with General Pillsbury, Assistant Chief of Engineers, with the result that a decision has been rendered on the points at issue in the controversy. This decision upholds the contention of the State on all major points and will lead to immediate advertisement for bids for three important and urgent levee units. The three levees scheduled for immediate construction are on the west side of the Sacramento River from Wohlfroms to Princeton, on the east side of the Sacramento from Colusa to Moulton Weir, and on the east side of the Feather River above Starr Bend.

San Joaquin River.

The contract for constructing three units of levee in Reclamation District No. 2064 on the San Joaquin River, was completed on December 6th. A total of 57,677 cubic yards was placed at a cost of $8,075, the unit price bing 14 cents per yard.

Flood Measurements and Gages.

The flood gaging stations and automatic recorders maintained by this office are now in operation, and arrangements are complete for making measurements of flood discharges should this be required.

DAMS

1. Construction of the Cajalco Dam of the Metropolitan Water District in Riverside County is progressing satisfactorily.

2. Work is progressing on San Gabriel Dam Number 1 of the Los Angeles County Flood Control District.

3. The Calero, Guadalupe, Stevens Creek and Vasona Dams of the Santa Clara Valley Water Conservation District have been completed. The fill at the Almaden Dam has been raised to its ultimate height. Work is now under way on the concreting of the spillway channel. The work remaining to be done at the Coyote Dam consists of placing the rock blanket and concreting of the spillway channel.

4. Work on the West Valley Dam of the South Fork Irrigation District in Modoc County and the Arcata Waterworks Dam of the city of Arcata in Humboldt County has been closed down for the winter.

5. Excavation for the abutments and spillway for the enlargement of the O'Shaughnessy Dam of the city of San Francisco is progressing satisfactorily.

6. Repair and alteration of the American River Head Dam and the Lake Francis Dam of the Pacific Gas and Electric Company is proceeding satisfactorily and will be completed shortly.

7. Repairs on the St. Helena Lower Dam, consisting of the placing of an upstream blanket and outlet tower, are under way.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work during the past month has been in the office on compilation of the 1935 Report covering the diversions, stream flow, and return flow in the Sacramento-San Joaquin territory and salinity in the Delta.

The flow of the Sacramento River at Sacramento is about 9500 second feet and there has been little variation during the past month.

California Cooperative Snow Surveys.

Work during the past month has been principally in the office bringing up to date the computation of normals for both precipitation stations and snow courses and compiling natural stream flow records for correlating the past snow survey data.

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty-five applications to appropriate water were received during the month of November; 14 applications were approved and 8 were denied, while 17 permits were revoked and 4 passed to license. Mining continues to be the predominant activity among appropriators.

On October 1st reports of progress were requested in connection with 1310 projects which are under permit and on December 1st, 887 reports had been filed.

On October 15th reports of status were requested in connection with 477 projects which are under license and on December 1st a total of 370 of these reports had been filed.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Field work was completed during November on the Paynes Creek Quadrangle in Tehama County and the Sebastopol Quadrangle in Sonoma County.

Some further progress was made toward completion of the field work on the Burney Quadrangle in Shasta County and the Kreyenhagen Hills Quadrangle in Fresno County. Progress was also made on the office work in connection with the Cucamonga No. 4 Quadrangle in San Bernardino County.

South Coastal Basin Investigation.

Work has been going on in a routine way on the South Coastal Basin Investigation. Preparations are being made for the annual report on change in water levels and other hydrology.

Sunset Boulevard Surfacing Removed by Burners Covering 900 Yards a Day

By J. M. LACKEY, Assistant District Construction Engineer

NOT many years ago building a State Highway meant moving out into the country or the mountains and for over a period of many months constructing a narrow roadbed, sometimes paving it with a 20 foot strip of concrete. But times have changed, particularly in District VII, for most likely the job will be the reconstruction of a busy city street or an important trunk highway in a thickly populated district with curbs and gutters and pavement 40 to 76 feet in width.

One of the latest projects of this kind to be completed was the resurfacing of portions of Sunset Boulevard between La Veta Terrace and Santa Monica Boulevard in the City of Los Angeles. The existing pavement was 5 inch portland cement concrete surfaced with asphaltic concrete which varied from 1½ to 4 inches in thickness. Several years of heavy traffic had developed many irregularities and the pavement became slippery when wet.

OLD SURFACE PROBLEM

The plans provided for the removal of portions of the old surfacing to permit laying a 1½ inch asphaltic concrete wearing surface. Removal of the irregular thickness of the old asphalt surface was no easy problem, as, under years of traffic the asphalt had become hard and tough. The special provisions of the contract provided that where an excessive quantity was removed the contractor should replace it at his own expense. An added complication was that a variable height crown was used, often changing several times in the distance of a block.

The old surface was removed by burning. At the beginning of the work two pavement burners were obtained from the City of Los Angeles, each unit being mounted on a truck. A single distillate burner covered with a 6 x 9 foot hood was suspended from cantilever arms from the rear of the chassis. A separate gasoline motor on the chassis operated air pumps attached to the burners.

NEW BURNERS CONSTRUCTED

Progress was so slow, however, with these burners that the contractor constructed two much larger outfits. Each unit consisted of six burners operated under a 9 x 15 foot hood mounted on wheels and towed by a two-cylinder road roller, both burners being operated together. A small compressor furnished air to both units. The procedure was as follows:

Grade points were set at from 10 to 20 feet intervals in the old surfacing and the amount of the cut painted near the point. The burners were then set to work, remaining stationary for from 3 to 5 minutes, depending on the thickness of the surfacing to be removed, then moving about 3 feet.

This operation was followed up with a tractor and grader which windrowed material loosened by the burning for loading into trucks. The surface was then checked, high spots marked and burned with the units obtained from Los Angeles City.

SMALL FUEL COST

From 550 to 900 square yards of surfacing were covered by the two large burners per 10 hour day. The area covered depended on the thickness of the old surface to be removed. Kerosene required for 10 hours of burning totaled 400 gallons, which, at a cost of 5 cents per gallon, amounted to from $0.025 to $0.036 per square yard for fuel.

On account of street cars, the burners could not operate within several feet of the rails, and a strip 17 feet wide was burned by direct application of distillate to the surface. In this manner, 200 to 300 square yards were burned per day, using about 300 gallons of distillate at a cost of 3½ cents per gallon, a total of $10.50, or $0.035 to $0.0525 per square yard.

The section paved was all outside the street car tracks and consisted of 27 feet of asphaltic concrete surfacing and a 2-foot cement concrete gutter on each side of the street. A 20-foot section out from the gutter was spread and finished with a finishing machine and the remaining 7-foot spread and raked by hand.

On the hand-raked section a concrete float was used after the hand raking in much the same manner as used on concrete pavement, with excellent results.

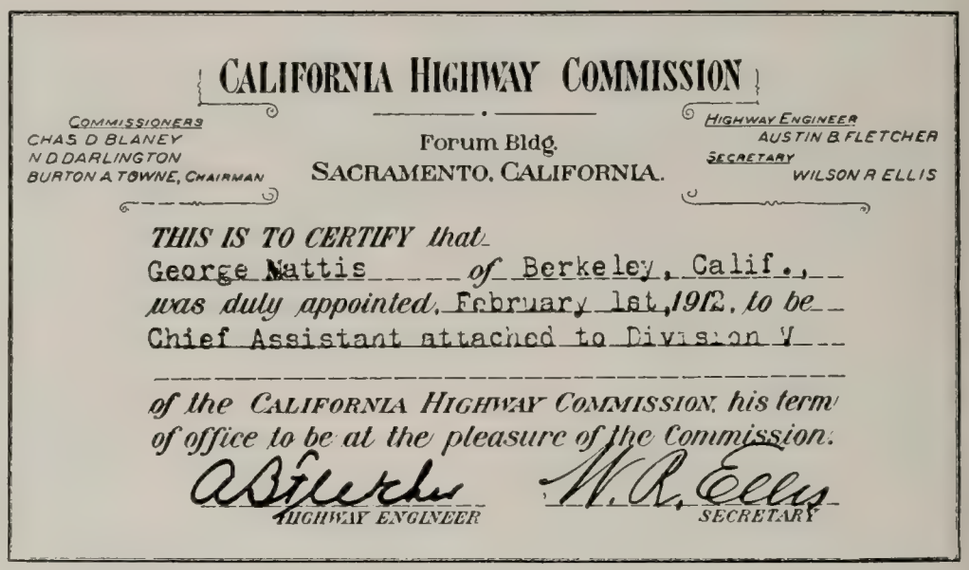
(Continued on page 29)

BURNING OPERATIONS on Sunset Boulevard resurfacing job in Los Angeles were carried on expeditiously without interruption of daily traffic of 20,000 to 23,000 autos per day in addition to suburban and interurban trains. Two large burners removed old asphaltic concrete surfacing at rate of from 550 to 900 square yards per day at cost of $2\frac{1}{2}$ to 3 cents per yard for fuel.

Old Timer, Do You Hold a Card to Beat This?

RETENTION of the honor of being head man in the Old Timers' Club of the State Division of Highways is getting to be rather difficult.

Each month since the club was started last July by E. M. Cameron, Construction Engineer, District 1, the oldest member in the organization has been displaced by some veteran whose appointment by the first California Highway Commission antedated that of the reigning charter member.



CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
George Mattis of Berkeley, Calif.,
was duly appointed, February 1st, 1912, to be
Chief Assistant attached to Division V
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A B Fletcher — HIGHWAY ENGINEER
W. R. Ellis — SECRETARY

GEORGE MATTIS of Berkeley, now a resident engineer of the San Francisco-Oakland Bay Bridge, takes leading place in the Old Timers competition this month with an apointment card dated February 1, 1912.

The only membership requirement is possession of one of the identification cards issued by the old Highway Commission in 1912 and thereafter to every man appointed on the staff of a division engineer.

Last month, E. J. Bassett, District Office Engineer, District 11, competed with Thomas H. Dennis, Maintenance Engineer of the Division of Highways, for the distinction of being the oldest member. Both hold identification cards issued on March 21, 1912.

But this month, both had to relinquish the honor to George Mattis of Emeryville, one of the Resident Engineers of the San Francisco-Oakland Bay Bridge, which is being built by the Department of Public Works. Mr. Mattis produced his ancient identification card showing he was appointed Chief Assistant of the old Division V of the Highway Commission on February 1, 1912.

CAN'T FIND CARD

A close runner-up is H. F. Holley of Los Angeles, now Assistant Chief Engineer of the Automobile Club of Southern California, whose membership application must be passed upon because, unfortunately, while Highway Commission records reveal he was named as an instrumentman attached to Division 1 on February 10, 1912, Mr. Holley, after much rummaging, has been unable to find his identification card.

W. V. Brady of Garden Grove, Orange County, also applied for membership, but is in the same category with Mr. Holley in that he can not locate his card. Mr. Brady says he was given the post of an assistant to J. B. Woodson, Division Engineer of Division VII, Fresno, by Austin B. Fletcher, California's first Highway Engineer, in February or March, 1912.

In his application letter, Mr. Mattis, forwarding his credentials, writes:

"I do not know whether I am eligible to the Old Timers' Club since my services were not continuous, but I feel just as old in years and service as if it had been continuous."

Mr. Mattis is eligible. He continues:

LEFT SERVICE IN 1919

"I served as Assistant Division Engineer in San Luis Obispo from February, 1912, to April, 1917, and then was transferred as Assistant Division Engineer to District (then Division) IV, San Francisco. After leaving the Highway Commission in September, 1919, I served one year as Assistant Engineer, California Railroad Commission, and two years as City Engineer of Oakland.

During the past two years I have been Resident Engineer on several units of the East Bay approach of the San Francisco-Oakland Bay Bridge, reporting to Col. Skeggs and Mr. P. O. Harding, and delighted to have the opportunity of again serving in the organization which meant so much to me in the past. I still remember the time when Mr. Dennis reported for duty at San Luis Obispo."

Mr. Holley writes expressing disappointment over his failure to find his identification card. He adds:

TEACHER THANKS HIGHWAY FIRE FIGHTERS FOR SAVING THE DECKER SCHOOLHOUSE

Appreciation of the efforts of employees of the State Division of Highways who, on October 23, 1935, saved the Decker District schoolhouse from destruction in the disastrous Malibu forest fire in Los Angeles County, is expressed in a letter received from Mrs. Helena K. Weaver, principal of the school, by Maintenance Superintendent Bernard M. Gallagher, who sent members of his crew to the scene of the fire. A stirring account of the battle against the flames, written by Mr. Gallagher, appeared in the November issue of California Highways and Public Works. In her letter, Mrs. Weaver said:

"The children and residents of the Decker School District wish to thank Mr. Roy Alley, Mr. John Schorr and the men who were with them (whose names we do not know) for their timely and able assistance in protecting and saving our school from destruction by fire on Wednesday, October 23, 1935. We are very grateful for their help and take this opportunity to express our appreciation."

The Division of Highway employees who assisted Mr. Alley and Mr. Schorr are C. F. Saman, William Dreasher, Norton, Flores, Dituri, Kanchl, Smith, Housman, Bradley and Albanez. Mr. Schorr's own home was burned down while he was engaged in helping to save the school.

CARD HELD BY OLD TIMER

(Continued from preceding page)

"I was appointed Instrumentman attached to Division I on February 10, 1912. I reported to Mr. W. S. Caruthers in Willits on the same date. Our location party was organized and we immediately left Willits for "Mountain House," Mendocino County, where we established camp. On February 15, 1912, we started the survey for the Cloverdale-Hopland road, beginning at the Sonoma-Mendocino county line.

CLAIMS FIRST STAKE

"In view of the fact that most of the first survey parties were organized on February 15, 1912, and started work some time thereafter, I believe our party drove the first stake on the California State Highway System."

Mr. Brady regrets he can not find his card and writes:

"I believe I had the honor to be the first one appointed in Division VII after Mr. Woodson. I have had varied and interesting experiences since that job, but sometimes wish I had stayed with the good old State Highway Department. They are a fine bunch of fellows."

"Was your bachelor party a success?"

"Rather, we had to postpone the wedding three days."

23,000 Daily Traffic Count Street Kept Open During Construction

(Continued from page 26)

One feature of the job was the use of a mortar-supported side form for support of the spreading machine on the side opposite the gutter. The forms which were only 1½ inches by 6 inches laid flatwise, were secured by driving a large spike through the plank into a wooden plug which had been wedged into a 2 inch hole drilled into the old P. C. C. pavement. The side form was then shimmed up to grade and the space underneath filled with a 1 to 5 cement mortar.

These side forms took a terrific pounding from traffic with very little damage and the maintenance cost was small. In a few places the mortar became reduced to a powder, probably due to using too dry a mix which dried out too soon.

Traffic on this street is very heavy at all times. Traffic counts taken in January, April and July, 1934, showed that Sunday traffic amounted to 15,000 to 19,000 cars per day and week day traffic from 20,000 to 23,000 cars daily. Street railway traffic is also heavy, carrying both interurban and local cars.

GOVERNOR MERRIAM ANNOUNCES WORK PROGRAM

(Continued from page 13)

The program of the Division of Architecture provides for construction of 18 new State building projects at an estimated total cost of $4,924,500, with an additional $600,000 for minor construction, improvements and equipment at various State institutions, colleges, prisons and armories.

It is estimated this program will supply directly and indirectly approximately 4,900,000 man hours work.

Of all the sad surprises
There's nothing to compare
With treading in the darkness
On a step that isn't there.

She (gushingly): "Will you love me when I am old?"

He: "Love you? I shall idolize you. I shall worship the ground under your little feet. I shall—um—er—You are not going to look like your mother, are you?"—*Pathfinder.*

Highway Bids and Awards

for December, 1935

ALAMEDA COUNTY—Undergrade crossing under Sacramento Northern Railway in Oakland, 2 concrete abutments and steel sup. str. 416' Rdy. Gr. & A. C. Pave. District IV, Mountain Boulevard Crossing. H. C. Vensano & Co., San Francisco, $60,438; M. B. McGowan, Inc., San Francisco, $51,108; Lindgren & Swinerton, Inc., Oakland, $50,782; Heafey-Moore Co., Oakland, $55,699. Contract awarded to A. Soda & Son, Oakland, $49,469.50.

ALAMEDA COUNTY—12th Street in Oakland, between 20-29th Avenue, Gr. and Pave. Asp. Conc. Remove and Relay R. R. Tracks. District IV, Route 105, Section Oak. Union Paving Co., San Francisco, $25,757; Independent Const. Co., Oakland, $26,857. Contract awarded to Heafey-Moore Co., Oakland, $41,238.45.

ALAMEDA COUNTY—In Oakland, Undergrade Xing Sac. No. Ry. 2 Conc. Abts., 1 Conc. Pier, Steel Sup. Str. 0.34 mi. Rd. Grade P. C. C. Pav. 0.24 mi. Rd. Grade, Pl Mix surf. District IV, Roadway Terrace Xing, Heafey-Moore Co., Oakland, $119,165; N. M. Ball Sons, Berkeley, $104,895; Barrett & Hilp, San Francisco, $111,737; H. C. Vensano, San Francisco, $129,343. Contract awarded to Lindgren & Swinerton, Inc., San Francisco, $103,386.50.

ALAMEDA COUNTY—At Jackson St. Under Gr. Xing, W. P. R. R. R. C. Abuts., Steel Sup. Str., 0.15 mi. rd. Grade, P. C. C. Pav. District IV, Route 105, Section Hay. McDonald & Kahn Co., Ltd., San Francisco, $92,372; Barrett & Hilp, $95,502. Contract awarded to Peninsula Paving Co., San Francisco, $87,161.

ALAMEDA COUNTY—Near San Leandro under grade Xing W. P. R. R. at Wash. Ave. 2 R. C. Abuts. St. Sup. Str. 0.26 mi. Grade and P. C. C. Pav. District IV, Route 69, Section B. Peninsula Paving Co., San Francisco, $154,560; Barrett & Hilp, San Francisco, $150,844; MacDonald & Kahn Co., Ltd., San Francisco, $171,914. Contract awarded to Bodenhamer Const. Co., Oakland, $149,371.30.

BUTTE COUNTY—Between 3.4 mi. E. of Butte Creek and Cherokee Canal, 2.9 mi. Grade, Un'tr. C. G. or S. District III, Route 45, Section A. Claude C. Wood, Stockton, $17,210; Leo F. Piazza, San Jose, $18,465; Heafey Moore Co., Oakland, $19,500; Hemstreet and Bell, Marysville, $21,062. Contract awarded to C. B. Bishop, Orland, $17,092.75.

CALAVERAS COUNTY—Bet. S. Fork Mokelumne R. and Herberts Rch. 1.8 mi. Grade and R. C. Bridge. District X, West Point Feeder Road. Contract awarded to Biasotti, Willard & Biasotti and Rocca and Co., Stockton, $146,939.

COLUSA COUNTY—Between Williams and N. boundary, portions of four existing concrete bridges to be removed and disposed of. District III, Route 7, Section B. C. Leo F. Piazza, San Jose, $2,881; Hemstreet & Bell, Marysville, $6,980; Geo. Pollock Co., Sacramento, $5,990; Nelson Hyde Chick, Berkeley, $7,570; F. H. Neilson, Orland, $3,746; M. G. McGowan, Inc., San Francisco. Contract awarded to M. A. Jenkins, Sacramento, $2,888.

FRESNO COUNTY—O. H. Xing over A. T. & S. Fe at Calwa 158' Tr. Spans 28-40' Conc. Gir. Spans on Conc. Piers & Abut. Approaches P. C. C. Pav. District VI, Route 4, Section B. Bodenhamer Const. Co., Oakland, $194,867; F. O. Bohnett Co., Campbell, $214,106; Oscar Oberg, Los Angeles $195,652; Rocca & Co., San Rafael, $209,008. Contract awarded to R. R. Bishop, Long Beach, $184,766.

FRESNO COUNTY—Between junction Rt. 41 and 1½ miles West 1.6 mile long Graded. District VI, route Sand Creek Road. Contract awarded to Stewart & Nuss & John Jurovich, Fresno, $30,244.

IMPERIAL COUNTY—Between 3 miles E. of Imperial and 0.5 E. of Brawley 9.8 miles. Grade, gravel and road mix surface treatment and timber bridge. District XI, Route 201, Section B. Geo. Herze & Co., San Bernardino, $59,454; V. R. Dennis Constr. Co. San Diego, $55,282; Oswald Bros., Los Angeles, $48,707. Contract awarded to R. E. Hazard & Sons, San Diego, $45,505.

INYO COUNTY—Between 1.8 mile N. of Bishop and 1.4 mi. N. of Laws, 2.6 miles to be graded. District IX, Route 76, Section A. Contract awarded to Basich Brothers, Torrance, $16,973.

KERN COUNTY—A grade separation proj. under the tracks of the S. P. R. R. consisting of two reinf. conc. abut. and a steel girder strct. for carrying the tracks of the R. R. together with incid. strct., the const. of a reinf. conc. bridge across Poso Cr., the grading and paving of approx. 2.2 miles of St. Hwy. and the const. of incidental struct. District VI, Route 4, Sec. E. Bodenhamer Construction Co. Oakland, $304,023; J. E. Haddock, Pasadena, $303,365. Contract awarded to Griffith Co., Los Angeles, $295,611.

KERN COUNTY—Two miles SW. of Searles to Rademacher Road. Mix surface treatment to be applied for a distance of about 5 miles. District IX, Route 145, Section A-B. A. S. Vinell Co., Los Angeles, $6,008; Basich Bros., Torrance, $6,90?. Contract awarded to Oilfields Trucking Co., Bakersfield, $5,215.

KERN COUNTY—Between the Easterly entrance to Kern County Park and 1¼ mi. Easterly about 1.3 mi. in length to be graded. District VI, Park Road. Rexroth and Rexroth, Bakersfield, $35,620; Oilfields Trucking Company, Bakersfield, $37,922; Basich Brothers, Torrance, $40,639. Contract awarded to Stewart and Nuss, Inc., and John Jurkovich, Fresno, $34,328.

KERN COUNTY—Between 4 mi. S. of Shafter and Shafter, 5.1 Mi. lg. Grade and Rd. Mix Surf. District VI, Route 139, Section B, C. Union Paving Co., San Francisco, $71,881; N. M. Ball Sons, Berkeley, $81,718; Basich Brothers, Torrance, $81,607; Dimmitt and Taylor, Los Angeles, $86,237. Contract awarded to Southern California Roads Co., Los Angeles, $67,509.50.

LAKE COUNTY—Two (2) standard timber cattle passes, between Upper Lake and Sweet Hollow Summit. District I, Route 15, Section B. Alfred T. Howe, Santa Rosa, $4,745. Contract awarded to Smith Bros. Co., Eureka, $2,713.55.

LOS ANGELES COUNTY—An undergrade crossing under the A. T. & S. F. Ry. at Hobart. District VII, Route 167, Section A. Griffith Co., Los Angeles, $148,335; Bannister-Field Co., Ltd., Fred E. Potts Co., Los Angeles, $156,757; Mundo Engr. Co., Los Angeles, $153,986; T. A. Allen Constr. Co., Los Angeles, $156,268; Oswald Bros., Los Angeles, $154,923; J. E. Haddock, Ltd., Pasadena, $162,419; R. E. Campbell, Los Angeles, $174,769; Basich Bros., Torrance, $152,417. Contract awarded to John Strona, Pomona, $146,122.50.

LOS ANGELES COUNTY—Between San Fernando Rd. and Central Ave., 0.6 mi. lg. A. C. Pavement. District VII, Route 161, Section Gndl. Oswald Bros., Los Angeles, $23,261; J. L. McClain, Los Angeles, $28,117; George R. Curtis Paving Co., Los Angeles, $19,032. Contract awarded to Southwest Paving Co., Roscoe, $18,529.25.

LOS ANGELES COUNTY—Steel and Conc. Overhead Xing A. T. & S. Fe at Wilmington 4-61.5' Spans, 2-42' Spans & 2-39' spans. Approaches Grade A. C. and P. C. C. paving. Mittry Bros. Const. Co., Los Angeles, $240,281; R. R. Bishop, Long Beach, $223,889; Bodenhamer Const. Co., & C. F. Robbins, Oakland and Los Angeles, $216,555; Griffith Co., Los Angeles, $212,637; Sander Pearson, Santa Monica, $238,306; Oswald Bros., Los Angeles, $218,786; Shafner & Gordon, Los Angeles, $242,994. Contract awarded to Sharp & Fellows, Contr. Co., Los Angeles, $202,941.30.

LOS ANGELES COUNTY—At Firestone Blvd., Undergrade Xing Pacific Electric Ry. District VII, Route 174, Section B. Griffith Company, Los Angeles, $139,201; Lynch-Cannon Eng. Co., Los Angeles, $122,984; Carlo Bongiovanni Const. Co., Hollywood, $122,224; Basich Bros., Torrance, $124,107; Byerts & Dunn, Los Angeles, $123,936; Herbert M. Baruch Corp., Ltd., Los Angeles, $129,715; Oscar Oberg, Los Angeles, $119,422. Contract awarded to Shofner & Gordon, Los Angeles, $106,024.

LOS ANGELES AND ORANGE COUNTIES—Between Luitwieler Ave. and La Mirada Ave. about 2.6 miles in length to be graded and surfaced with selected material base. District VII, Imperial Highway. J. E. Haddock, Pasadena, $333,199; Oswald Bros., Los Angeles, $335,561; Basich Bros., Torrance,

Highway Bids and Awards

(Continued from preceding page)

$359,968. Contract awarded to R. E. Campbell, Los Angeles, $332,995.

LOS ANGELES COUNTY—Between Spring Street and Hathaway Ave., 2.5 mile Grade and Timber bridge. District VII, Somerset Avenue. Oswald Bros., Los Angeles, $62,812; Sully Miller Contr. Co., Long Beach, $62,936. Contract awarded to R. E. Campbell, Los Angeles, $61,182.

LOS ANGELES COUNTY—Drainage sumps to be excavated, and backfilled with sand, between 1⅛ miles NW. and 1⅛ SE. of Norwalk. District VII, Route 174, Section B. Kovacevich & Price, Inc., South Gate, Paul R. Hughes, Long Beach, $3,320; Owl Truck & Materials Co., Compton, $3,362; Ansco Constructing Co., Long Beach, $3,618; The Price Company, Santa Monica, $4,510; Kuhn Bros., Inc., Manhattan Beach, $4,752; Geo. J. Bock Co., Los Angeles, $4,892; John Oberg, Los Angeles, $7,576; V. Lovrich & L. B. Konjevod, Los Angeles, $8,350. Contract awarded to Theodore G. Smith, South Gate, $2,772.

MENDOCINO COUNTY—At the Oaks and at Clow Creek, 1.75 mi. lg. Grade, Surf. Cr. R. Gr., Liq. Asp. Tr. District I, Route 48, Sections A & B. Hemstreet & Bell, Marysville, $42,943; Claude C. Wood, Stockton, $43,498. Contract awarded to N. M. Ball Sons, Berkeley, $38,488.

MENDOCINO COUNTY—One standard timber cattle pass, Sta. 172—between Hopland and Ukiah, Mendocino County. District I, Route 1, Section B. Alfred T. Howe, Santa Rosa $3,162. Contract awarded to Smith Bros. Co., Eureka, $1,723.

MODOC COUNTY—Between 2½ miles west of Cedarville Nevada State Line, 11.8 miles Grade, Pentr. Oil Tr. District II, Route 28, Section C. Hemstreet & Bell, Marysville, $92,574. Contract awarded to C. F. Fredricksen & Sons, Lower Lake, $79,235.40.

MONTEREY COUNTY—An undergrade crossing, under the tracks of the S. P. R. R. District V, Route 2, Section Sal. M. B. McGowan, Inc., and C. W. Caletti & Co., San Francisco, $254,638; MacDonald & Kahn Co., Ltd., San Francisco, $276,365; Union Paving Co., San Francisco, $261,332. Contract awarded to F. O. Bohnett Co., Campbell, $249,108.05.

MONTEREY COUNTY—Undergrade Xing of S. P. R. R. at Soledad. Roadway paved with P. C. C. and Rd. Mix Surf. District V, Route 2, Section D. McDonald & Kahn Co., Ltd., San Francisco, $185,912; Barrett & Hilp, San Francisco, $169,252; Peninsula Paving Co., San Francisco, $161,453. Contract awarded to Paul J. Tyler, Lord & Bishop, Sacramento, $155,187.40.

ORANGE COUNTY—At Northam Under grade Xing, A. T. & S. F. Ry. 2 Conc. Abts., W. Ws and Steel Sup. Str. Slope Pav. 0.86 mile Rd. Grade and P. C. C. Pave. District VII, Route 171, Section B. J. E. Haddock, Pasadena, $106,484; Oswald Bros., Los Angeles, $106,309; Basich Bros., Torrance, $107,601. Contract awarded to Mundo Engineering Co., Los Angeles, $104,729.

ORANGE COUNTY—Batavia Street in the city of Orange between Walnut Avenue and La Veta Ave., about 1 mile to be graded and a Road-mix surface treatment to be applied. District VII, Batavia Street Feeder. C. F. Robbins, Los Angeles, $10,460; Paul R. Hughes, Long Beach, $11,035; A. S. Vinell Co., Los Angeles, $11,388. Contract awarded to Square Oil Co., Los Angeles, $6,681.

ORANGE COUNTY—Between Bay Boulevard and Bolsa Chica Rd. 2.9 mi. lg. Grade, Sel. Mtl. Surf., Bit. Mac. Armor Coat. District VII, Route 183, Sections S1.B & A. Martin Bros. Trucking Co., Long Beach, $52,489; J. E. Haddock, Ltd., Pasadena, $57,695; Oswald Bros., Los Angeles, $51,252; J. L. McClain, Los Angeles, $63,073; Sharp & Fellows Cont. Co., Los Angeles, $48,824; Gogo & Rados, Los Angeles, $53,881. Contract awarded to Sully-Miller Contracting Co., Long Beach, $44,651.50.

PLACER COUNTY—Various locations between Lincoln and Newcastle 1.5 mi. Grade, portion Cr. Run Base and Seal Coat. District III, Route 91, Section A. A. Teichert & Son, Inc., Sacramento, $28,879; Kennedy Construction Co., Oakland, $34,863; L. C. Seidel, Sacramento, $28,490; J. R. Reeves, Sacramento, $28,278; Leo F. Piazza San Jose, $29,501; Claude C. Wood, Stockton, $28,519. Contract awarded to Hemstreet & Bell, Marysville, $28,131.30.

PLUMAS COUNTY—Between Ede's Ranch and Beckwourth Pass about 5.5 miles in length to be graded, road-mix surface treatment and seal coat to be applied. District II, Route 21, Section G. Hemstreet & Bell, Marysville, $73,821; Dunn & Baker, Klamath Falls, $69,656. Contract awarded to A. Teichert & Son, Inc., Sacramento, $67,255.

RIVERSIDE COUNTY—2.2 miles west of Indio over S. P. tracks O. H. Xing 1-61′ span 2-45.5′ Spans, Grade Pave P. C. C. 0.54 mile. District XI, Route 26, Section E. Lynch Cannon Engr. Co., Los Angeles, $105,836; Griffith Co., Los Angeles, $120,202; J. E. Haddock, Ltd., Pasadena, $118,477; John Strona, Pomona, $128,403; Dimmitt & Taylor, Los Angeles, $109,062; Matich Bros., Elsinore, $111,163; Oswald Bros., Los Angeles, $111,595. Contract awarded to B. G. Carroll, San Diego, $105,829.

RIVERSIDE COUNTY—Between 1.4 mile south of Thermal and Junction Rt. 26 5.4 miles long. Plant mix surfg. District XI, Route 187, Section F. Oswald Bros., Los Angeles, $30,057; Gibbons & Reed Co., Burbank, $49,737. Contract awarded to R. E. Hazard & Sons, San Diego, $28,456.

RIVERSIDE COUNTY—O. H. Str. over S. P. R. R. 1-70′ st. pl. gird, sp. & 4-47′ st. beam sps. on conc. piers with tim. pile founds. District VIII, Route 19, Section D. Shannahan Bros., Inc., Los Angeles, $59,400; Oscar Oberg, Los Angeles, $59,237; Lynch Cannon Eng. Co., Los Angeles, $53,997; R. R. Bishop, Long Beach $51,909; Lindgren & Swinerton, Inc., Los Angeles, $53,205; T. A. Allen Const. Co., Los Angeles, $52,309. Contract awarmded to Byerts & Dunn, Los Angeles, $51,838.

SACRAMENTO COUNTY—At 16th Street, Sacramento, the existing undergrade crossing to be widened. District III, Route 3, Section Sac. Charles Kuppinger, Lakeport, $39,007. Contract awarded to Lord & Bishop, Sacramento, $36,026.25.

SACRAMENTO COUNTY—Between Walnut Grove and Freeport, 16.4 mil. lg. Grade, C. R. B. widening, portions resurf. Pl. mix Surf. District III, Route 11, Section E.F. Union Paving Co., San Francisco, $139,523; J. A. Casson, Hayward, $147,680; Peninsula Paving Co., San Francisco, $148,899. Contract awarded to A. Teichert & Son, Inc., Sacramento. $131,857.80.

SAN BERNARDINO COUNTY—Between Westerly Boundary and Rt. 59 4.7 mi. grade, Road mix, Surf. Treat. District VIII, Route 61, Section A. Gibbons & Reed Co., Burbank, $144,234; V. R. Dennis Constr. Co., San Diego, $158,153; J. E. Haddock, Ltd., Pasadena, $153,012. Contract awarded to Basich Bros., Torrance, $130,917.50.

SAN BERNARDINO COUNTY—Between 1 mi. N. W. of Lake Arrowhead and L. Arrowhead Dam 2.5 mi. lg. Grade and Road Mix Surface Treat. District VIII, Route 59, Section E. Geo. Herz & Co., San Bernardino, $84,925; J. E. Haddock, Ltd., Oswald Bros., Los Angeles, $97,447; Sharp & Fellows Contr. Co., Los Angeles, $83,961; Basich Bros., Torrance, $91,115; Lewis Constr. Co., Los Angeles, $109,756; Gibbons & Reed Co., Burbank, $94,337. Contract awarded to Geo. J. Bock Co., $80,512.30.

SAN BERNARDINO COUNTY—Eight miles west of Needles, an overhead crossing over the tracks of A. T. & S. F. Railroad consisting of 1-56′, 2-53′6″, 2-17′6″ spans on concrete piers; and a bridge across a drainage channel consisting of 4-19′ timber spans on timber pile foundations to be constructed. Approx. 0.57 mile to be graded and surfaced with Road-mix surfacing. District VIII, Route 56, Section N. Matich Bros., Elsinore, $75,709; A. S. Vinell Co., Los Angeles, $63,961; R. E. Campbell, Los Angeles, $78,898. Contract awarded to Basich Bros., Torrance, $54,142.

SAN BERNARDINO COUNTY—L. A. Co. line to Pipe Line Ave., 2.7 miles lg. Grade, Liq. Asp. Treat, Tim. Pile Trestle. District VIII, Route 77, Section A. V. R. Dennis Construction Co., San Diego, $73,331; George J. Bock Co., Los Angeles, $63,757; Matich Bros., Elsinore, $66,900; A. S. Vinell Co., Los Angeles, $63,952; Basich Bros., Torrance, $63,905; Oswald Bros., Los Angeles, $64,425. Contract awarded to Dimmitt & Taylor, Los Angeles, $62,278.60.

SAN BERNARDINO COUNTY—An undergrade crossing under the tracks of the A. T. & S. F. railway near Verdemont consisting of 2 concrete abutments with steel and concrete superstructure and grading and surfacing approx. 0.57 mile of highway with plant-mixed surfacing (slow curing type). District

(Continued on page 32)

Highway Bids and Awards

(Continued from page 31)

VIII, Route 31, Section A. George J. Bock Co., Los Angeles, $65,062; R. E. Campbell, Los Angeles, $89,786; C. F. Robbins, Los Angeles, $75,875; Bannister Field Co., Ltd., and Fred E. Potts Co., Los Angeles, $72,748. Contract awarded to Geo. Herz & Co., San Bernardino, $60,808.30.

SAN FRANCISCO COUNTY—Widen Un. Gr. Xing, at Army Street under S. P. R. R. District IV, Army St. Xing. Barrett & Hilp, San Francisco, $40,629; Alfred H. Vogt, Co., Inc., San Francisco, $42,785; H. C. Vensano & Co. San Francisco, $44,976; Eaton & Smith, San Francisco, $45,615; McDonald Kahn Co., Ltd., San Francisco, $45,746. Contract awarded to M. B. McGowan, Inc., San Francisco $38,969.

SAN FRANCISCO COUNTY—Widening O. H. Xing over S. P. R. R., Williams St., San Francisco, 1-42′ and 1-43′ St. I Spans, St. Bent. Conc. Absts. & W. W. District IV, Williams St. Xing. Eaton & Smith, San Francisco, $31,862; Chas. L. Harney, San Francisco, $31,325; MacDonald & Kahn, Co., Ltd., San Francisco, $29,506; Alfred H. Vogt, San Francisco, $33,675; H. C. Vensano & Co., San Francisco, $35,015; Barrett & Hilp, San Francisco, $31,595; Lindgren & Swinerton, Inc., San Francisco, $31,299. Contract awarded to F. C. Amoroso & Sons, San Francisco, $28,940.

SAN JOAQUIN COUNTY—An undergrade Xing under tracks of S. P. R. R. and W. P. R. R. at Charter Way, 0.29 mile to be graded and paved with P. C. C. District X, Route 5, Section Stockton. Paul J. Tyler, Lord & Bishop, Sacramento, $289,064; C. W. Caletti & Co., San Rafael, $282,194; Bodenhamer Construction Co., Oakland, $285,250; Union Paving Co., San Francisco, $279,991; MacDonald & Kahn Co., Ltd., San Francisco, $310,201. Contract awarded to Biasotti, Willard & Biasotti and Rocca & Co., Stockton, $267,421.15.

SAN JOAQUIN COUNTY—Const. an overhd. crossing over the tracks of the S. P. R. R. ½ mi. east of Tracy, consisting of one 81 ft. and two 48 ft. plate girder spans, two 52 ft. steel beam spans and twenty-nine 40 ft. reinf. conc. girder spans on conc. bents and abutments with wingwalls on timber pile foundations. Approx. three-tenths (0.3) mile to be graded and paved with P. C. C. Pavt. District X, Route 5, Section A. F. O. Bohnett, Campbell, California, $225,373; Bodenhamer Const. Co., Oakland, $225,638; Rocca & Co., San Rafael, $225,955; McDonald & Kahn Co., Ltd., San Francisco, $239,876; Union Paving Co., San Francisco, $241,010; Paul J. Tyler, Lord & Bishop, Sacramento, $245,692; M. B. McGowan, Inc., & C. W. Caletti & Co., San Francisco, $249,538; Healy, Tibbits Const. Co., San Francisco, $242,123. Contract awarded to Lindgren & Swinerton, Inc., Oakland, $223,255.74.

SAN LUIS OBISPO COUNTY—Between 1 mile E. Cholame & Kern Co. line 6.6 miles long, Grade C. R. Base, Rd. mix Surf. District V, Route 125, Section D. Peninsula Paving Co., San Francisco, $206,132; Granfield, Farrar & Carlin, San Francisco, $202,649; George Pollock Co., Sacramento, $237,364; Union Paving Co., San Francisco, $206,910. Contract awarded to A. Teichert & Son, Inc., Sacramento, $177,031.

SANTA BARBARA COUNTY—A reinforced Conc. girder bridge extension on Las Positas Rd. over the S. P. R. R. at Santa Barbara. District V, Las Positas Crossing. Robert D. Paterson, Santa Barbara, $13,458; D. A. Loomis, Glendale, $15,380. Contract awarded to Parish Bros., Los Angeles, $12,425.50.

SANTA BARBARA COUNTY—Between 1 mile E. Santa Ynez and Los Olivos 5.4 mi. lg. Grade Gravel Base, Rd. mix. Surf. District V, Route 80, Section A. C. F. Fredericksen & Sons, Lower Lake, $108,152; Basich Brothers, Torrance, $115,247; Gogo & Rados, Los Angeles, $107,890; Gibbons & Reed Co., Burbank, $114,117; M. J. B. Construction Co., Stockton, $132,002; Granfield, Farrar & Carlin, San Francisco, $119,983. Contract awarded to Oswald Bros., Los Angeles, $94,078.

SANTA CLARA COUNTY—An undergrade crossing under the tracks of the Southern Pacific R. R. at Embarcadero Road in Palo Alto consisting of 2 abutments and steel superstructure and approx. 0.21 mile of roadway to be graded and paved with P. C. C. District IV Embarcadero Road Crossing. F. O. Bohnett, Campbell, $155,316; Union Paving Co., San Francisco, $152,707; Barrett & Hilp, San Francisco, $134,986; Rocca & Co., San Rafael, $164,313; A. J. Raisch & A. G. Raisch, San Francisco, $164,195. Contract awarded to Eaton & Smith, San Francisco, $132,213.59.

SANTA CRUZ COUNTY—Through Ben Lomond about 0.5 mile to be graded, surfaced with bit. mac. on crush. run base and 2 brs. constructed. District IV, Route 116, Section A. Peninsula Paving Co., San Francisco, $61,677. Contract awarded to Lord & Bishop, Sacramento, $55,835.75.

SHASTA COUNTY—Between 1½ mi. East of Bella Vista & Diddy Hill, about 7.7 mi. in length to be graded and surfaced with crusher run base and plant-mixed surfacing. District II, Route 28, Section A. A. Teichert and Son, Inc., Sacramento, $228,172; Hemstreet & Bell, Marysville, $199,045; Union Paving Co., San Francisco. Contract awarded to Peninsula Paving Co. San Francisco, $197,656.50.

SONOMA COUNTY—Bet. Stony Pt. Rd. and Cotati 1.8 mile lg. Grade, R. R. Base, Bit. Mac. Surf. District IV, Route 104, Section C. Union Paving Co., San Francisco, $63,639; C. F. Fredericksen and Sons, Lower Lake, $66,671; Pacific States Construction Co., San Francisco, $73,717; C. W. Caletti and Co., San Rafael, $76,579; Granfield, Farrar and Carlin, San Francisco, $77,402; A. G. Raisch, San Francisco, $77,825. Contract awarded to N. M. Ball Sons, Berkeley, $60,856.70.

STANISLAUS COUNTY—Between Riv. Rd. and 2 mi. W. of Gates Rd. 3.1 mile Grade, Rd. mix Surf. Tr. and Bridge. District X, Route 110, Section A. C. W. Caletti and Co., San Rafael, $187,867; N. M. Ball Sons, Berkeley, $168,519; Paul J. Tyler-Lord and Bishop, Sacramento, $183,556. Contract awarded to Pacific Bridge Co., San Francisco, $162,973.50.

TEHAMA COUNTY—Between southerly boundary and 3 mi. N. of Los Molinos, 14.8 miles long, Rd. Wdg. Untr. Cr. Gr. or stone base-plant mix surf. District II, Route 3, Sections A & D. Peninsula Paving Company, San Francisco, $185,607; A. Teichert & Son, Inc., Sacramento, $146,714; J. A. Casson, Hayward, $184,991; Pacific States Construction Co., San Francisco, $165,278; Union Paving Co., San Francisco, $146,605; Heafey-Moore Co., Oakland, $178,006. Contract awarded to Hemstreet & Bell, Marysville, $146,014.70.

TULARE COUNTY—Between Yokohl and 1 mi. N. Lemon Cove, 6.6 mi. lg. Grade, C. R. Base, Rd. mix. surf. District VI, Route 10, Section D. A. Teichert & Son, Inc., Sacramento, $152,182; Basich Brothers, Torrance, $150,071. Contract awarded to Union Paving Co., San Francisco, $147,771.90.

TUOLUMNE COUNTY—Between Sullivan Creek and 3½ mis. Easterly about three and four-tenths mis. in length to be graded and surfaced with road-mix surfacing on untrt. crushed gravel or stone base. District X, Route 13, Section C. Hemstreet & Bell, Marysville, $116,916; Peninsula Paving Co., San Francisco, $129,979; Biasotti, Willard and Biasotti, Stockton, $108,649; M. J. B. Construction Co., Stockton, $116,785. Contract awarded to Union Paving Co., San Francisco, $104,233.20.

VENTURA COUNTY—Bet. W. Casitas Pass & E. Casitas Pass, 2.4 mile long, Grade, Road-mix Surf. Treat. District VII, Route 151, Section B. Granfield, Farrar & Carlin, San Francisco, $109,712; Basich Bros., Torrance, $102,270; Sharp & Fellows Contr. Co., Los Angeles, $99,646; J. E. Haddock, Ltd., Pasadena, $115,835; Gibbons & Reed, Burbank, $107,468. Contract awarded to Daley Corp., San Diego, $97,129.50.

VENTURA COUNTY—Between Somis and Saticoy, 5.9 miles lg. Grade and pl. mix surf. District VII, Route 9, Section A B. C. F. Robbins, Los Angeles, $61,057; Southwest Pav. Co., Roscoe, $58,409; Basich Brothers, Torrance, $52,808; A. S. Vinell Co., Los Angeles, $59,801. Contract awarded to Oswald Bros., Los Angeles, $51,208.90.

"Shay, waiter, find my hat!"
"It's on your head, sir."
"Don't bother, then, I'll look for it myself."

Father: "Fancy a big boy like you being afraid to sleep in the dark."

Five-Year-Old: "It's all very well for you, you've got mother to look after you."

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

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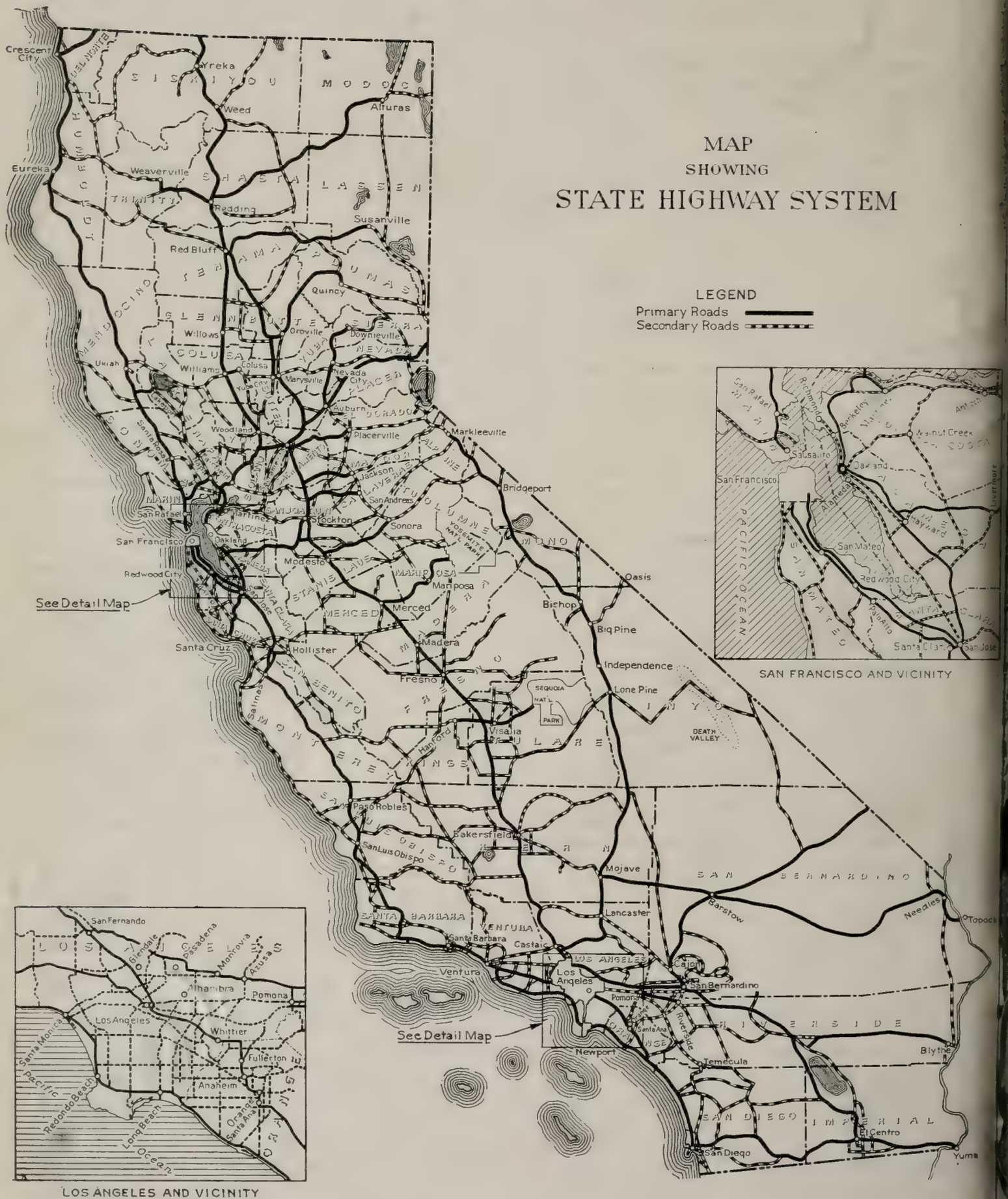

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CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

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Scene on State Highway No. 11, (U.S.40) in Snow Sports Area near Donner Summit.

Official Journal of the Department of Public Works

FEBRUARY 1936

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State Has Only $15,469,891

from Gas Tax and Motor Vehicle Fees

For Major Highway Construction

During the Current Biennial Period

By **EARL LEE KELLY,** Director, Department of Public Works

DURING recent months certain interests have sought to develop in the public mind the idea that California is deriving from its gasoline tax revenues many more millions than are needed for the adequate development of its splendid State highway system to keep pace with the ever increasing demands of motorized traffic.

I have encountered this propaganda in various localities throughout our commonwealth when I stated my wish for the New Year was that I could get enough money to give the people of California all the highways they have asked for and urgently need instead of having only some $15,000,000 to satisfy a $100,000,000 demand.

Such, however, is the situation that confronts us in the current biennium when out of all available State funds for highway expenditures the counties are getting $31,308,000, the cities $12,187,500, and other State departments are sharing to the extent of $686,000, while the State Division of Highways has only $15,469,891 of actual State revenues for major highway construction projects.

EARL LEE KELLY

It is well, therefore, at this time to present the following complete statement of our highway revenues and expenditures for the enlightenment of our citizens who may be misled or confused by the extravagant statements of diversion propagandists:

Based on the budgeted amount of revenue from the gas tax the total collections for the current biennium are estimated at $86,700,000. Of this amount approximately 10 per cent or $8,700,000 is divided as follows:

(a) To pay refunds, as authorized, to any purchaser of motor vehicle fuel not used in motor vehicles operated on public highways, estimated at $8,422,000;

(b) To the State Controller for accounting services, estimated at $64,000;

(c) To the State Board of Equalization, the collecting agency, estimated at $214,000.

Deducting the 10 per cent from the $86,700,000 gross total of gas tax collections leaves $78,000,000 available for allocation. Of this amount one-third or $26,000,000 is allocated to the counties. Each county first receives a flat payment of $7,500 each quarter and the balance is distributed in the proportion that the number of motor vehicles in each county bears to the total

(Continued on page 14)

Damage in Sacramento Levee Breaks Confined by Flood Control Project

By **R. L. JONES**, Deputy State Engineer

A FLOOD occurred in January in the Sacramento Valley, as the result of a storm which produced rainfall generally over the entire valley and foothills, with snow in the maintains, commencing on January 9th and ending on January 16th. The rainfall was relatively light on the valley floor and was heaviest on the watershed of the upper Sacramento River.

The resultant runoff caused a medium flood stage in the Sacramento River above its confluence with the Feather River. The runoff from the Feather, Yuba, Bear and American watersheds caused only low flood stages in these streams. The storm was relatively light in the San Joaquin River watershed.

At the latitude of Sacramento the peak quantity of water passing in the Sacramento River and in the Yolo By-pass was 133,000 second feet, or 22 per cent of the 600,000 second feet which the flood control project is designed to carry.

BY-PASS FLOWS MODERATE

The storm was not sufficiently prolonged to produce severe flood conditions. The flow in the American River was comparatively light and it was not necessary to open the Sacramento weir gates. The Little Holland tidal reclamation in the lower Yolo By-pass was flooded. All of the by-passes and the river overflow areas were covered with water to small depths, but the by-passes carried only moderate flows.

The flood was of approximately the same size as that of April, 1935, except that it was more concentrated on the upper Sacramento River than on the Feather, Yuba and American rivers. The snow on the ground at Norden on January 9th was 67 inches and on January 18th was 110 inches.

The rainfall at various points on the Sacramento, American and Feather rivers during the storm is shown in the following tabulation:

RAINFALL—January, 1936

	8	9	10	11	12	13	14	15	16	17
Kennett	0	3.54	1.68	2.68	0	1.80	2.09	2.95	1.02	1.02
Oroville	0	.42	1.82	.82	.30	.42	.68	.06	.12	0
Folsom	.06	1.12	1.04	.88	0	.16	.86	.20	.34	0
Sacramento	.05	.98	.35	.84	T	.19	.32	.05	.01	0

OVERFLOW CHANNELS FILLED

The rivers and overflow channels commenced filling almost immediately and water began flowing over the weirs commencing first at the Tisdale weir. The Moulton weir was last to spill. The Sacramento weir passed water over the gates one foot deep, but the gates were not opened.

The crest heights reached at various stations in the Sacramento flood control project were as follows:

CREST HEIGHTS

Station	Height January, 1936	Height April, 1935	Flood Height
Sacramento River at Red Bluff	24.8	23.7	
Sacramento River at Colusa	26.3	25.1	30.3
Sacramento River at Tisdale Weir	48.8	48.2	53.0
Sacramento River at Knights Landing	30.1	30.2	34.6
Sacramento River at Fremont Weir	36.4	36.6	42.0
Sacramento River at Verona	35.4	35.8	41.8
Sacramento River at Sacramento	26.5	28.6	31.3
American River at Folsom	15.7	18.8	
Yolo By-pass at Lisbon	16.7	17.3	26.2

ESTIMATED MAXIMUM DISCHARGES

	January, 1936	April, 1935
Sacramento River at Red Bluff	120,000	110,000
Sacramento River at Verona	63,000	67,000
Sacramento River at Sacramento	75,000	95,000
American River at Fair Oaks	43,000	70,000
Yolo By-pass at Lisbon	50,000	58,000

BREAKS IN LOW LEVEES

The only serious condition developed by this flood was in respect to the levees on the Sacramento River above Colusa, on the west side from Wohlfrom's Bend to Princeton, and on the east side from Colusa to Moulton weir. These levees, having a length of about 15 miles, have not been completed to project grade and section and in many places the water reached practically to the tops.

Not only are these levees low and of small section, but they are in poor condition, with many squirrel and gopher holes. Considerable effort was expended in preventing breaks in these levees on January 16th and 17th. Assistance was rendered to the landowners by WPA relief workers, CCC boys and the Division of Water Resources maintenance force.

The principal difficulty encountered in the fight to prevent levee breaks was the great number of leaks caused by squirrel and

(Continued on page 18)

OVER THE TOP of a low levee and through a resulting breach went flood waters of the Sacramento River near Colusa in the January storm. The levee had not been completed to grade and was weakened by rodent holes. In top picture State Engineer Edward Hyatt (left) and Col. A. M. Barton, manager of State Reclamation Board are examining the break, of which different views are shown below.

Realignment Eliminates Two Railroad Crossings and Turns in Redlands City

By **E. Q. SULLIVAN**, District Engineer

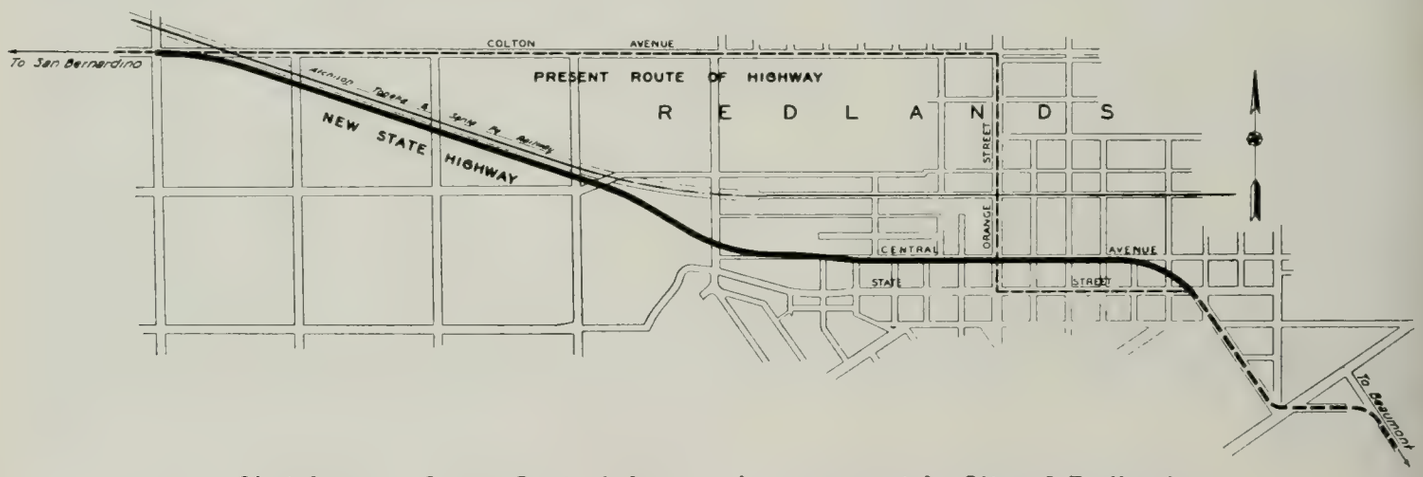
THE city of Redlands in San Bernardino County saw the fulfillment of a long-cherished plan for civic improvement on January 9, last, when the new $400,000 link of highway 99 traversing the city via State Route No. 26 was formally thrown open to traffic.

Two right angle turns and two dangerous railroad crossings on the old route through Redlands are eliminated by the new Central Avenue stretch, which swings off of Colton Avenue entering the city from the north and runs through the center of town, encountering only one major intersection and one major railroad crossing before leading out of the city toward Beaumont, Banning and the Coachella Valley.

"Through the power invested in me by Governor Frank F. Merriam, I hereby declare this highway open to the motorists of California."

Director of Public Works Kelly highly commended Redlands for the civic spirit that made the improvement possible involving as it did the setting back of property in the business district. The $400,000 cost of the undertaking was borne by the state and the city of Redlands, the latter contributing $60,000. The state's share was made up of gas tax and NRA funds. Director Kelly said the new highway, which is 1.9 miles long, is one of the best in California.

The roadway is 76 feet wide and is surfaced with portland cement concrete pavement 20 feet wide flanked by crushed rock shoulders with seal coat surfacing. The shoulders are 6 to 8 feet wide outside of the city and 28 feet wide inside the city limits.



Sketch map of new Central Avenue improvement in City of Redlands.

Ceremonies attended by citizens of Redlands and nearby communities, and state, county and city officials marked the opening of the new link. Director of Public Works Earl Lee Kelly, Harry A. Hopkins, chairman of the California Highway Commission, and C. D. Hamilton of Banning, member of the commission, represented the state.

OFFICIAL OPENING CEREMONY

A program of speech making preceded formal acceptance by the state and Redlands of the project. Opening of the link was signalized when Miss Jessie Reynolds, secretary of the Redlands chamber of commerce, cut a ribbon stretched across the highway, and Chairman Hopkins of the Highway Commission said:

Chairman Hopkins said eternal vigilance in protecting the gas tax fund from interests which seek continually to divert it to other purposes made possible the building of the link.

PRAISE FOR LEGISLATORS

"Highways bring people closer together, create social intercourse and improve education. We should be thankful that we have men in our legislature who are not gas tax diversionists. If the gasoline tax money that the motoring public pays into the state's

(Continued on page 25)

Property of
Seattle Public Library

BEFORE AND AFTER views of the new Central Avenue routing of State Highway No. 26 through the City of Redlands reveal what this improvement means from both traffic and aesthetic standpoints. The old routing on this section of U. S. 99 crossed two railroads as it entered town from the north and made two right angle turns from narrow streets in the congested business section. The revised routing cuts directly across the city on new right of way that involved the moving back of property lines and buildings in some places. The upper left photo shows Central Avenue before widening at its intersection with Orange Street, the main business avenue of the city. The large picture just below shows the completed improvement at the intersection. The pictures in the lower group of four are companion views of "eyesore" sections of the city that have been greatly improved and even beautified by the new highway, particularly where it runs through the city dump. At this point the dumping grounds will be further screened by trees and shrubs.

Santa Monica Tunnel Completed and Opened to Traffic at Formal Ceremony

BRAVING wet streets and a continuous drizzling rain, a crowd estimated at 1000 persons gathered about the east portal of the newly constructed Santa Monica tunnel on Saturday afternoon, February 1st, to witness brief ceremonies in which state, county and city officials joined in dedicating the new 400-foot tunnel under Colorado and Ocean avenues in the city of Santa Monica.

The opening to traffic of the tunnel, which joins the Roosevelt Highway with Lincoln boulevard, completes the final link of an extensive program begun by the state in 1932 for improving the coast highway through the great recreational beach area in the vicinity of Santa Monica.

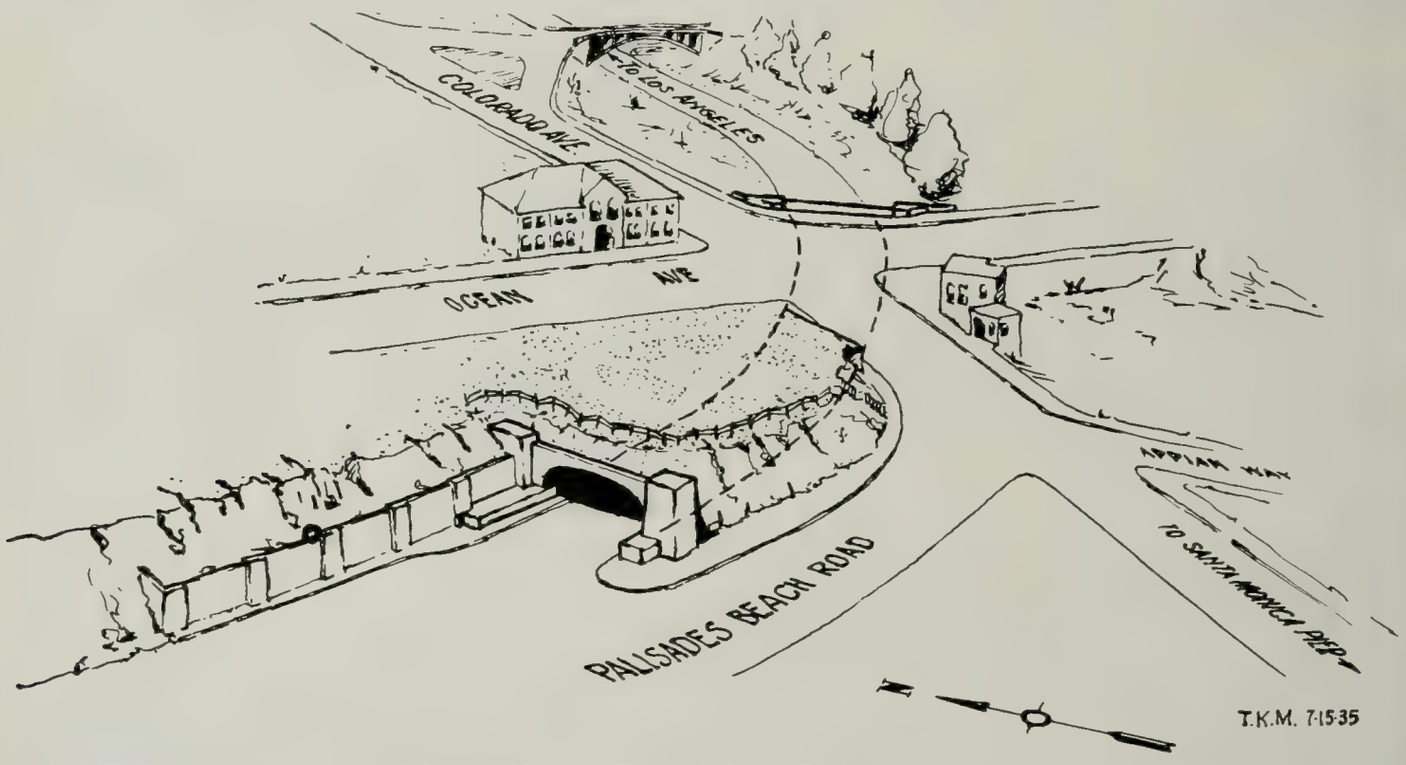
Plans for an elaborate dedicatory ceremony which included a parade and barbecue in the tunnel were called off shortly before the exercises were to commence because of the unfavorable weather conditions.

PARADE THROUGH TUNNEL

Both approaches to the new tunnel were thronged with machines as the traffic barriers at the west portal were removed for the first time, and the cars of the official party paraded through the tunnel to the accompaniment of music by the Santa Monica municipal band. At the east portal of the tunnel the officials left their cars and were escorted to a speaking platform.

Supervisor John R. Quinn of the fourth district of Los Angeles County acted as master of ceremonies, and the first part of the program was limited to the introduction of visiting officials and the engineering staff and contractor responsible for the construction of the tunnel.

Earl Lee Kelly, Director of Public Works, as official representative of Governor Merriam, extended the well wishes of the Governor to all present. He then spoke briefly of the significance of the project as one more unit in the coast highway improvement program designed to eliminate traffic congestion between Santa Monica and Long Beach.



SKETCH showing route of Santa Monica Tunnel from Beach road under park and city avenues.

LINKS CITY WITH COAST

He pointed out that, with the completion of the Olympic boulevard improvement, the tunnel will be an important link in taking traffic directly from the coast highway into

(Continued on page 27)

THROUGH TUNNEL TO COAST at Santa Monica went a cavalcade of autos when the ribbon was cut February 1st. Flat arch construction and four traffic lanes are features. In official group—Police Chief Webb, F. C. Balfour, Dr. J. D. Davenport, City Commissiooner Ted Plumer, Assistant State Director of Public Works Justus F. Craemer; City Commissioner Tex Millikan; State Director of Public Works Earl Lee Kelly; Miss Norma Dolan, Mayor W. H. Carter, James C. Dolan, Olympic Boulevard Association; District Engineer S. V. Cortelyou; Supervisor John R. Quinn, Engineer F. J. Grum, Assistant State Highway Engineer G. T. McCoy, Construction Engineer D. R. Warren; Resident Engineer P. R. Watson.

Highway Congress Urges Equitable Fuel Taxes and Continuance of Federal Aid

The recent annual meeting of the American Association of State Highway Officials was attended by Harry A. Hopkins, chairman of the California State Highway Commission. In the following article Mr. Hopkins summarizes the latest information and official opinion on highway statistics and trends as revealed in the convention reports and resolutions, and the relation of these factors to California conditions.

By **HARRY A. HOPKINS,** Chairman California Highway Commission

THE twenty-first annual meeting of the American Association of State Highway Officials met in Miami, Florida, December 9th to 12th, inclusive, and all the states had officials of their highway departments in attendance with the exception of two. Representing the State of California were C. H. Purcell, State Highway Engineer, and the writer.

The meeting began on the twenty-first anniversary of the association and was attended by a record number of representatives from the several states, there being close to five hundred registered.

In giving a resume of the proceedings and accomplishments of the meeting, space will not permit a lengthy paper. Were one able to review the developments in highway construction in detail for the past twenty-one years it would read like a story of the Arabian Nights. When we know that twenty-one years ago there were a little over 1,700,000 automobiles registered and now there are over 26,000,000 and that the state and county highway mileage in the United States twenty-one years ago only totaled 257,291 miles of surfaced highways compared with a present grand total of 897,181 miles, it is apparent that tremendous strides have been made in providing comfortable transportation facilities for American highway users.

HARRY A. HOPKINS

In 1934 the states surfaced over 24,000 additional miles and while the highway departments were attempting to catch up on this part of highway construction the state legislators added 40,000 miles to the existing state systems.

At the present time six states have their entire highway mileage surfaced and thirty have their state systems 80 per cent surfaced.

NO SURFACING GAIN

The highway systems of the states, counties and townships total 422,582 miles, of which about 13% are on state systems, 44% on county systems and 33% on the township or town systems.

Mileage added to state systems in 1935 did not disclose any percentage in gain for surfaced miles. There are twelve additional states whose state road systems are more than 90% surfaced and twelve more whose state systems are between 80% and 90% surfaced. There are nine states whose state systems are less than 25% dustless or better.

California Ranks 8th in Percentage of Improved Highways

(Continued from preceding page)

Californians are proud of their highway system and its development. In fact, there are times when we like to brag. And while it is true that California has set a record for standardization and high type of construction we find ourselves in the same position as most of the progressive states in that we have a long way to go to catch up with our requirements.

CALIFORNIA'S HIGHWAY RANK

In proof of this statement and to counteract the oftmade statement that California is about built up in highway construction and in testimony of what a tragedy it would be to California if any of our highway funds were used for other than the purpose for which they were intended we offer the following interesting figures:

States that have 10,000 miles or more in their highway systems number fourteen. California with 14,019 miles is seventh among the states. Pennsylvania is first.

There are thirteen states with three thousand miles plus of pavement of all types. California with 5731 miles is fifth. Illinois is first.

Fourteen states have two thousand miles or more of macadam and gravel, low cost mix roads. California with 2885 miles is ninth. Pennsylvania is first.

Twenty-one states have 2400 miles or more of sand, clay, macadam and gravel untreated roads. California makes a good showing here with only 2439 miles and places twentieth. Louisiana has more miles of this type of road than any other.

Nine states with 10,000 miles or more have a larger percentage of their highways improved. California is eighth in this class with 11,065 miles and Pennsylvania first.

20,865 MILES SURFACED

For roads in both county and state systems that are improved on rural free mail delivery routes California is second with 20,865 miles or 91 per cent surfaced. We only have 1249 miles in the state's system that are unimproved in some manner or other.

Since 1925 California has made wonderful strides in constructing bridges. Four hundred fifty-five have been built up to the year 1935, and during the same period 184 grade crossings have been eliminated. In the United States over the same period 37,172 bridges were built and 6604 railroad crossings eliminated. There were in our state, 1149 railroad crossings not eliminated by overhead or underpass on January 1, 1935, and in the United States, 17,879. On county and township systems the number remaining in California is 12,850 and in the United States 120,670.

PUBLIC ENEMY No. 1

In the general sessions of the association many fine papers were offered and considerable discussion was had by different groups on the subject of the tremendous toll in deaths and accidents on the highways of our country. It is very apparent that many drivers of motor vehicles believe they are

(Continued on page 22)

RESOLUTIONS PASSED BY AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

WHEREAS, The extension of highway facilities and the modernization of existing construction are necessary to adequately provide for the expanding use of motor vehicles; and

WHEREAS, It has been the established policy of the Federal Government for many years to participate with the States in the development and improvement of a limited system of highways essential to the welfare of the nation; and

WHEREAS, In work of a continuing character it is desirable to avoid sporadic efforts which result in bursts of activity followed by periods of inaction; and

WHEREAS, The maintenance of construction programs on an even keel and the avoidance of delays in undertaking such programs may be accomplished only by adequate advance planning based upon a definite knowledge of future availability of funds; now, therefore, be it

RESOLVED, That this association strongly urge upon the Congress of the United States the necessity for providing at this time authorizations for the continuance of regular Federal aid to the States for highway construction for a period of not less than two years (fiscal years 1938 and 1939) in amounts of not less than $125,000,000 for each fiscal year, together with authorizations for each fiscal year for the following purposes in amounts of not less than $12,500,000 for forest highways, roads and trails; $2,500,000 for roads through public lands, nontaxable Indian lands and other Federal reservations, $7,500,000 for roads in national parks, and $4,000,000 for Indian reservation roads, in order that proper plans may be matured for the prompt, efficient and economical usage of such funds.

WHEREAS, It is manifestly unjust to discriminate in the taxation of road users; and

WHEREAS, During the past four years there have been developed motor fuels, other than gasoline, for use in motor vehicles on the public highways, roads and streets of the States; and

WHEREAS, These recently developed motor vehicle fuels are being used in such amounts as to lessen service fees formerly derived by the States; and

WHEREAS, These fuels are used by some classes of motor vehicles to an extent that they are not paying their proportionate share of the cost of construction and maintenance of highways, roads and streets; now, therefore, be it

RESOLVED, That the American Association of State Highway Officials urgently requests that the respective State legislatures take such action as will properly and equitably tax all motor vehicle fuels.

Spraying and Burning Vegetation Along California State Highway Roadsides

By **W. A. SMITH,** Assistant Maintenance Engineer

CALIFORNIA, in common with other western states having an arid summer season, has a special problem in the reduction of fire hazards to property and watershed cover along her roadsides.

The spraying and burning of roadside vegetation for the 1936 season is now under way. This work, which involves protective measures along 1100 miles of State highways at an annual expense of some $80,000, has been a regular part of the Division of Highways maintenance program since 1929. Prior to that time, control measures were undertaken only at locations where owners of adjoining property or local organizations cooperated in the work.

The purpose of this roadside spraying and burning is to provide a firebreak between the highway and adjoining property. Its justification lies in the protection afforded the property owner or public interests against the increased hazard due to volume of motor traffic which improved highways bring, as well as in prevention of erosion damage to highways at locations where natural cover may be destroyed by fire, and also in the fact that insurance rates on grain lands are thereby kept to a lower level.

MAXIMUM RESULTS POLICY

The State highway program has been planned on the basis of maximum results in fire hazard reduction for the amount expended, rather than attempting 100 per cent clearing as advocated in some sections. A definite policy covering the selection of areas to be so treated is being followed.

In general, no spraying is done opposite locations where a natural or artificial firebreak already exists, either adjacent to or within a reasonable distance of the right of way. It is considered that the clearing of vegetation from locations adjacent to orchards, vineyards, plowed land, railroad rights of way, or streams which parallel the highway is not justified, as reasonable protection already exists.

Likewise, bare cut slopes five feet or more in height present a natural obstruction against fires being started by passing traffic.

Spraying and burning can only be carried on, to advantage, over grassy areas. Where brush abounds, clearing is the only effective measure and, when that is done at considerable expense, the area is exposed to the growth of grass and a more hazardous condition is thus created.

DEVELOPED BY EXPERIMENTS

The spray material adopted and methods followed, as well as the equipment used in making the application, were developed as the result of considerable experiment. Likewise, problems have arisen in the matter of burning the sprayed areas which required standardization.

Under conditions encountered in California, where the vegetation drys up rapidly with the coming of the first hot days of the season, it is necessary to spray a strip to either kill or dry out the grass sufficiently so that it may be burned while adjacent areas are still too green to present a hazard. This strip is ordinarily 9 feet in width, immediately adjacent to the fence lines and was adopted as being the maximum which can be handled by means of the spray bar equipment.

The location adjacent the fence lines includes the area of heaviest vegetation and also permits burning of the section between the shoulder and sprayed area later, if that seems desirable.

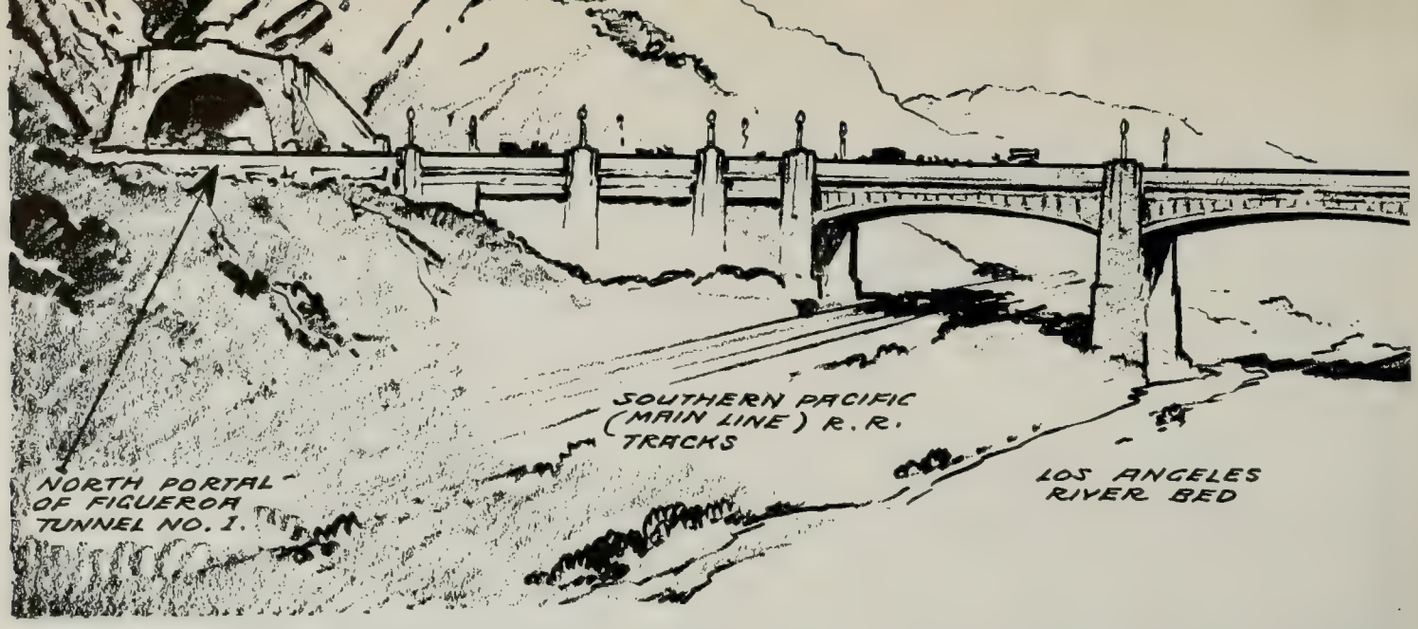
STERILIZATION NOT DESIRED

It must be borne in mind that efforts are directed simply to creating a firebreak. It is not desired to sterilize the soil, since at many locations it may not be necessary to spray another season. On account of the appearance, there are many individuals and some organizations who roundly criticize the work.

For most effective and economical results, the spray material should be applied when the vegetation is about two inches high. At that time the area can be uniformly covered; the growth is tender and practically a perfect kill is assured. There is the further advantage at this stage that no burning is required, although it may be necessary later to go over certain low areas where moisture starts a new growth.

(Continued on page 26)

SPRING CLEANING STARTS in Winter on State Highway roadsides and the annual spraying and burning operations are under way along an 1100 mile front. At top, a 10-foot spray bar of a Diesel oil spraying unit. Center, a weed spraying outrigger on oil spreader trailer. Inset shows hand-spraying method. At bottom, burning operations with protection for trees and motorists.



OVER RIVER, RAILROADS, AND BOULEVARDS, a wide 1100-foot viaduct will carry the highway extension link of Figueroa Street from Tunnel No. 1 of the chain of three tunnels built through Elysian Park in Los Angeles to join North Figueroa Street on the other side of the river valley. The main river span will be 200 feet long. This sketch by Charles Owens is reproduced by courtesy of the Los Angeles Times.

State Building $650,000 Figueroa Street Viaduct in Los Angeles City

By **CHARLES WEST JONES,** Senior Field Construction Engineer, Bridge Department

FOR years the mountains and the Los Angeles River have been a barrier to through traffic on Figueroa Street, one of the main north and south traffic arteries in the city of Los Angeles. This traffic in the past has been forced to take a long circuitous path around the mountain, through the congested business section of the city.

At last, due to the combined efforts of the city, the state, and the federal government, the engineering dream of breaking through the barrier to secure a direct route for Figueroa Street traffic is about to be realized. The complete program includes a chain of four tunnels, three of which have already been bored through the mountain, and the fourth is under construction.

As part of this program, the state has recently awarded a half million dollar contract for the construction of a 1000-foot viaduct link starting at the northerly tunnel portal in Elysian Park.

JOINS NORTH FIGUEROA STREET

The viaduct will cross above the various tracks of the Southern Pacific Railroad, the tracks of the Los Angeles Railway, the Los Angeles River, and San Fernando Road to join North Figueroa Street, and will also make direct connection with the proposed Arroyo Seco Parkway to South Pasadena and Pasadena, a new route added to the State Highway System by act of the legislature of 1935.

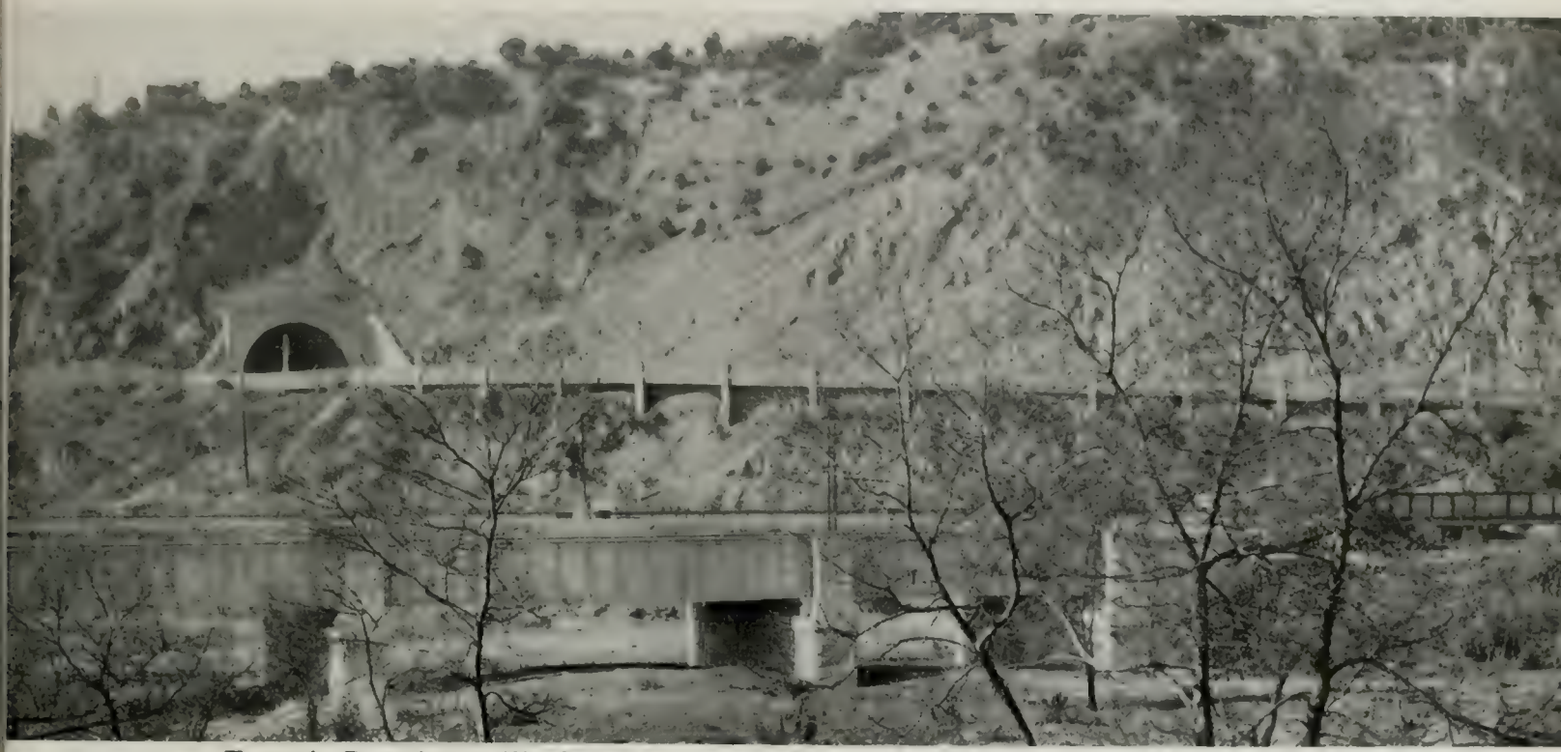
The engineering forces of the state and city of Los Angeles cooperated in designing the viaduct. It will be an imposing structure with a main river span 200 feet long crossing the river at an elevation of some 70 feet above the stream bed. Long spans will cross the railroad tracks on each side of the river. The vehicular roadway will be 44 feet in width and, in addition there will be sidewalks on each side of the roadway.

This project, which will give employment to many persons, will be financed from federal funds made available under the 1935 apportionment of Emergency Relief funds. The work will be done under the direct supervision of the state.

CONSTRUCTION PROBLEMS

Viewing the project from a construction standpoint, some of the major problems will be the building of deep river piers adjacent to the railroad tracks without endangering or interfering with railroad service and the spanning of San Fernando Road without interrupting street car and vehicular traffic. It is proposed to construct the main river pier on the north bank of the Los Angeles River around and over the large Glendale outfall sewer without injuring that structure.

(Continued on page 26)



Tunnel Portal at Elysian Park and Riverside Drive where viaduct will connect.

Tunnel Vista showing three completed Figueroa Street bores through park.

Cities and Counties Get $43,495,500

(Continued from page 1)

registration in the State. Deducting the counties' apportionment from the total leaves $52,000,000 available for the State highway fund.

A tabulation of distribution to this point is as follows:

Total estimated revenue		$86,700,000
Deduct approximately 10% as follows:		
(a) Refunds	$8,422,000	
(b) State Controller	64,000	
(c) Board of Equalization	214,000	8,700,000
Balance		$78,000,000
Deduct 1/3 for counties		26,000,000
Balance for State highway fund		$52,000,000

To the above there is added a portion of the Motor Vehicle Fund made up of transfer fees, chauffeurs' license fees, headlight testing fees, and the motor vehicle fees. All of this money, except the motor vehicle fees, goes to the Department of Motor Vehicles plus not to exceed 35 per cent of the motor vehicle fees. This leaves 65 per cent of the motor vehicle fees for distribution, one-half to the counties and one-half to the State Highway Fund. The payment to counties is based on the motor vehicle registration as above stated.

A summary of the above figures is as follows:

Estimated motor vehicles fees	$16,332,308
35% for Division of Motor Vehicles	5,716,308
Balance	$10,616,000
1/2 to counties	5,308,000
Balance to State Highway Fund	$5,308,000

A third source of revenue for highway use is the regular Federal Aid contribution of the National Government estimated at $9,513,919 for the current biennium.

A Federal aid appropriation has been regularly made by the Federal Government to the State since 1921 and, for the first time, the appropriation has not been made for both fiscal years of the biennium.

The total revenue for State highways is, therefore, as follows:

Gas tax (2 cents per gallon)	$52,000,000
Motor vehicle fees	5,308,000
Federal aid	9,513,919
Total	$66,821,919

From the $52,000,000 of gas tax revenue must be deducted the shares allotted to the cities by action of the State legislature as follows:

HOW CITIES PARTICIPATE

For city streets of major importance, 1/4 cent or 7/8 of 1/4 cent as only 7 apportionments are available in this biennium	$5,678,500
For State highways within cities 1/4 cent	6,500,000
Total	$12,187,500

This brings a reduced balance for State Highway uses as follows:

Total State highway revenues from gas tax, motor vehicle fees, and Federal aid	$66,821,919
Deduct allocations to cities	12,187,500
Balance	$54,634,419

The allocations made from this total State Highway balance through the Division of Highways are shown in the following tabulation:

Administration (which includes approximately $408,000 to the Controller, Department of Finance, State Treasurer, Attorney General, etc.	$2,558,919
Maintenance	15,215,500
Construction and improvement	36,860,000
Total	$54,634,419

The distributions made from the $36,860,000 allocation for construction and improvement are as follows:

Item	Amount	Per cent of total budget
Preliminary engineering	$1,198,395	1.8%
Construction engineering	2,043,390	3.1%
Rights of way	2,725,850	4.1%
Betterments and minor improvements	4,350,000	6.5%
Joint highway districts	225,000	0.3%
Contingencies	1,333,555	2.0%
Major projects	24,983,810	37.4%
Total	$36,860,000	55.2%

It will be noted in the above distribution that $24,986,000 is allotted for major construction projects. That figure, as already stated, includes $9,513,919 of Federal aid funds.

Deducting this Federal money, leaves the sum of $15,469,891 as the actual amount of

(Continued on page 15)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY ..... Director
JOHN W. HOWE ..... Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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BUILT FOR SAFETY

As Exhibit "A" of Highways Built for Safety, the Automobile Club of Southern California presents the Los Angeles-Bakersfield route.

Excepting the paving to be laid over grade now being finished for about five miles from Kern County line to Fort Tejon, it is now three-laned throughout from Los Angeles to the floor of San Joaquin Valley due to elimination of the last "bottleneck" by a new bridge at Tujunga Wash on San Fernando Road.

Adding another traffic lane from the foot of Grapevine Grade to the northern boundary of Kern County is the last job required to make this route safer and entirely modern. It is expected that the 1937–39 state budget will provide funds for this.

Does widening the road add to safety?

While this organization believes that a highway should be widened only as traffic requires it, it offers the following answer to the safety question as taken from state accident records:

On a 27-mile section of modern THREE-LANE highway on this route from Castaic School to Gorman there were only seven traffic accident fatalities during 1934.

On the 27-mile adjacent section of old TWO-LANE highway from Kern County line below Grapevine Grade north to the road angle point south of Bakersfield, there were 25 accident deaths during 1934.

Both sections of the same highway carry equivalent traffic loads, approximately 4000 vehicles per day, according to the club.

Seven fatalities against twenty-five indicate that traffic safety can be engineered into highway construction.

—Automobile Club of Southern California.

Budget Faces Loss of $4,756,960 From Federal Aid Funds

(Continued from page 14)

the State's own revenues that the Division of Highways can absolutely count on as available for new highway construction:

Major project allocation	$24,983,810
Estimated Federal aid revenue	9,513,919
Actual State revenue available for construction projects	$15,469,891

The significance of the reference to this $15,469,891 as "Actual State revenue" is made apparent by the fact that only one-half of the $9,513,919 Federal aid has been appropriated to the State up to date and President Roosevelt has recommended to congress that the other one-half be deferred until 1938.

If this second appropriation is not received the allocation for major projects would be reduced by $4,756,960, leaving available in the current biennium the sum of $20,226,850 for major construction projects derived from both State and Federal aid funds.

MEANS FEWER PROJECTS

The loss of $4,756,960 Federal aid would necessarily mean a revision of the Division of Highways budget for the current biennium and the withdrawal of proposed projects that will cost approximately the amount of the Federal aid reduction. The deferment of these long needed improvements or additions to many parts of the State highway system would be a keen disappointment to localities that would be affected and in some cases might prove a real hardship.

The American Association of State Highway Officials at its recent annual meeting passed resolutions urging Congress and the Federal Government to continue this Federal aid, and citizens' committees in California and other states are sending petitions to Washington in support of the resolutions.

Salesman: "These stockings are the very latest patterns, fast colors, holeproof, won't shrink, priced far lower than elsewhere, and a very good yarn."

Co-ed: "Yes, and you tell it well, too."

Tommie had always been much afraid of dogs. One day, after a struggle to get him to pass a large dog which stood on the corner, his mother scolded him for his unnecessary fear.

"Well," was the reply, "you'd be afraid of dogs if you were as low down as I am."—*Parent's Magazine.*

State Completes Extensive Surfacing Project on Death Valley Highways

By **S. W. LOWDEN**, Acting District Engineer

IN THE budget allocations for secondary roads within the State Highway System for the 87th-88th fiscal year were included a number of projects for the improvement of Route 127 extending from a junction with Route 23, the Los Angeles-Reno Highway, in the vicinity of Lone Pine, Inyo County, to the San Bernardino County line at Ibex Pass, a distance of 179 miles.

This route is rapidly becoming known as the Mount Whitney-Death Valley Highway, and will, in future years, become one of the most scenic drives within the state borders. Its importance is indicated by the increased number of travelers into this desolate region, traffic records indicating that visitors have doubled in number for each of the past three years. The winter season of 1934–1935 allowed 45,000 persons to view the unique scenic features contained within the boundaries of the Death Valley National Monument, and enjoy the weird natural wonders amid the eerie solitude and stillness of this peculiar historic area.

LARGE TRAFFIC INCREASE

Traffic counts being maintained by the monument authorities indicate that up to February 1, 1936, the volume of travel this season has substantially increased over that of preceding years, and it is anticipated that by May 1st of this year the increase in the number of visitors will largely reward the judgment of the Department of Public Works in allocating sufficient funds for this important route to provide the many betterments recently completed.

As the main entrance to the Death Valley area, these improvements were needed to overcome the dust and rough condition of the roads which, prior to the installation of a hard surface, were typical of roads to be found in isolated desert regions, and could not be traversed with the speed and comfort of present day demands.

The construction of bituminous treated surfacing involving 3450 tons of asphaltic road oil, placed at a cost of $93,000 obtained from the state gas tax revenues, was completed on December 20, 1935, and that work accomplished the conversion of dusty, graveled roadbeds into fine specimens of wide, smooth highways.

FURTHER CONSTRUCTION PLANNED

Second in importance to the surface treatments in the State's program of improvement is the proposed construction from the westerly end of the toll road recently acquired by the State, westerly toward Lone Pine. This construction contemplates an improvement which will eliminate the hazards now encountered by traffic through Darwin Wash and over Zinc Hill.

Surveys for this portion of the improvement have been completed recently which will eliminate the steep grades, precipitous slopes and insecure formations encountered throughout the course of the existing road.

The improved road will permit travel through inspiring open spaces along easy slopes, with the utmost safety and convenience, at the same time preserving and making more impressive the aesthetic values of the Panamint Valley and surrounding mountain ranges which spread as a mosaic before the eyes of the traveler.

DARWIN-KEELER IMPROVEMENT

A further improvement that will be thoroughly appreciated by the motoring public is the proposed elimination of the existing one-way road between the old mining camps of Darwin and Keeler. The latter town borders the extensive dry bed of Owens Lake, which until a few years ago comprised one of the major bodies of water lying east of the Sierras, but which has been dried up by the collection of the waters of Owens Valley in the aqueduct of the city of Los Angeles.

Still another improvement contemplated in the near future is the construction of a three-mile unit adjacent to Townsend Pass. This improvement lying on the westerly side of the Panamint range of mountains winds through a canyon of rugged cliffs of kaleidoscopic coloring. Ultimately a point is reached where there is presented to view over the miles of wasteland, the snow-clad summits of numerous peaks of the Sierra Nevada range, that reach an elevation in excess of 14,000 feet. Chief

(Continued on page 27)

SURFACED ROADS FOR DEATH VALLEY—Through "Devil's Corn Patch," four miles east of Stove Pipe Wells. No. 2—In Darwin Wash, Zinc Hill in background. No. 3—Section south of Death Valley Junction. No. 4—Amargosa River crossing between the Junction and Shoshone. Eagle Mountain in distance. No. 5—Between Shoshone and Ibex Pass.

Sacramento Levee Break Caused But Little Crop Damage

(Continued from page 2)

gopher holes. Had these not existed, there would have been less difficulty in protecting the levees, although they were not of sufficient height to withstand a further rise of water.

BREAKS TOTAL 500 FEET

The levee on the east side of the Sacramento River broke in three places a short distance south of the Moulton weir during the night of January 16th and early morning of the 17th. These breaks were practically together and the levees were opened to a total length of approximately 500 feet. A considerable quantity of water was released through these breaks, which almost immediately began to reduce the water heights which were threatening the levees to the south on both sides of the river. By noon of January 18th no further danger of levee breaks existed.

The damage occasioned by the break on the east side near the Moulton weir was confined to erosion on the Johnston ranch. After water passed through the breaks it flowed directly eastward into the Butte basin overflow, and in passing removed the newly plowed top soil from an area of approximately 100 acres.

These levees are scheduled for completion to full grade and section by the California Debris Commission during 1936, in time to care for the floods in the winter of 1936–37.

Except for limited damage done by erosion at the break near Moulton, this flood caused no damage to lands protected by the Sacramento Flood Control Project works. As usual, a small amount of damage was occasioned to improvements and crops in the overflow areas and by-passes.

These areas are intended primarily for the passage of flood waters, and a certain amount of damage is inevitable at each small flood when the lands are used for other purposes. In reporting on the flood, the daily press emphasized these occurrences, indicating that a damaging flood was in progress, whereas the entire flood control project system in its completed parts was functioning perfectly.

30 Million Commuters Per Year Will Use the Bay Bridge Terminal

THE San Francisco-Oakland bay bridge terminal to be built between First and Fremont streets and facing Mission street in the city of San Francisco is designed to accommodate one of the world's largest annual pedestrian movements representing 30,000,000 commuter trips a year.

The total number of persons to pass through this building the first year is expected to equal one-fourth the population of the United States. Most of them, of course, will be commuters, 50,000 of whom will pass through this building each morning and evening.

The building was designed by engineers of the staff of Chief Engineer C. H. Purcell, with architectural treatment by Timothy L. Pflueger, Arthur Brown, Jr., and John L. Donovan. It will be 65 feet high, 800 feet long and faced with terra cotta of granite texture.

ENCLOSED RAMP SYSTEM

The loading platforms enclosed in the terminal will be 700 feet long. The building is really an enclosed system of ramps and stairways connecting the street and street car concourse to the four loading platforms for the six tracks of the East Bay trains.

The Market Street Railway and Municipal Railway cars of San Francisco will swing south off Market street down First and on to a ramp at the front of the terminal building. Three tracks will be provided on this elevated street car ramp at the front of the terminal.

In the basement of the terminal a huge garage space for 755 cars will be provided.

INTERURBAN RAILWAY LOOP

The building will be open at both ends for the six tracks of the interurban railway loop, but the tracks for the loop are under roof.

Beneath the interurban railway loading platforms is a seating space for commuters in a waiting room 135 feet wide by 220 feet long. Here will be located the usual newsstands and concessions for the convenience of the traveling public.

This terminal is part of the $15,000,000 interurban railway project that is part of the San Francisco-Oakland Bay Bridge which is being built for the California Toll Bridge Authority of which Governor Frank F. Merriam is chairman, by the State Department of Public Works, of which Earl Lee Kelly is director.

SAN FRANCISCO TERMINAL of Bay Bridge as it will appear when completed is indicated by white arrow. The building will accommodate six tracks of the interurban railway loop.

FRONT OF TERMINAL showing elevated ramp for three tracks of street cars. The building provides a waiting room 135 feet wide by 220 feet long.

The long-awaited contracts, necessary to obtain an additional $10,000,000 from the RFC for the construction of the terminal and the addition of interurban railway facilities, have been completed.

These contracts now must pass the scrutiny of the California Toll Bridge Authority, the State Railroad Commission, and the Reconstruction Finance Corporation.

The Reconstruction Finance Corporation by resolution has already committed itself to advancing an additional $10,000,000 which, with $5,000,000 saved out of the original $61,400,000 loan, will provide the $15,000,000 necessary to construct the bridge railway, terminal building, and viaducts. This additional advance was contingent upon State legislation since enacted.

In compliance with RFC requirements, the contracts provide for discontinuance of all interurban passenger ferry service, and for operation over the bridge railway of the Key and Southern Pacific east bay trains, these facilities to be operated by the existing carriers.

Newport Beach Grade Separation Plan Includes Two Bridges and Ramps

By **A. D. GRIFFIN,** District Office Engineer, District VII

FOURTEEN years ago the Southern Pacific Railroad grade separation was constructed to pass the Coast Highway under the railroad at Newport Beach and thus eliminate the hazard of collisions between vehicles and trains. As years passed traffic on the Coast Highway between Long Beach and San Diego, and the cross traffic on the intersecting county highway between Santa Ana and Newport Beach increased tremendously, and traffic congestion on Sundays and holidays became unbearable.

Frequently cars on both the State highway and the county road were held up an hour or more in negotiating this intersection, and serious accidents were frequent.

COOPERATION PROPOSED

And so it hapuened that eight years ago City Engineer R. L. (Pat) Patterson of Newport Beach, and Orange County Engineer N. H. (Nat) Neff, proposed to join with the State in a three-way cooperative project for construction of a highway grade separation that would lift the county road up to the level of the railroad viaduct and carry it over the State highway.

Since that time these two capable engineers have worked long and hard on the proposition. Subsequently, the Newport Beach-Santa Ana county road was made a State highway and taken out of county jurisdiction, but nevertheless Nat Neff's best efforts have always been available to the State in furthering plan work on the project.

Another man who was most helpful was R. C. (Bob) Mize, an old timer in Orange County who is the attorney for most of the property owners in the vicinity of the Newport Beach grade separation, but F. M. Strobridge, formerly of Newport Beach, now of Los Angeles, is without question the "granddaddy" of the Newport Beach grade separation.

"CONVERSATION ENGINEER"

So frequent and regular have been his visits to the district office in the effort to expedite an undertaking close to his heart that we look on him as a part of the State highway organization. Mr. Strobridge is exceptionally well posted upon engineering subjects, so much so that upon one occasion he was asked if he was a civil engineer. His reply was, "I have the degree of C. E. but in my case it means "Conversation Engineer."

The "conversation stage" for the Newport Beach grade separation project was a long one because there were so many points that had to be settled before plan work could be consummated. We not only had Mr. Strobridge's services as a "conversation engineer," but the record further shows that he most generously donated to the State for right of way large areas of land from his own property in Newport Beach that were needed for the proposed construction work.

Other generous donations of right of way made this project possible. Great credit is due George Machris and his brother, Alfred Machris, who control the Wilshire Oil Company, for the donation to the State of large areas of land also needed for right of way. These men also gave the State certain so-called "borrow rights."

"BORROW RIGHTS" DEFINED

Now, the term "borrow rights" is a misnomer. It would be more proper to call them "take rights." What is meant by "borrow rights" is that the State can excavate and remove earth material from a location on private property outside of the right of way, and transport it to construct roadway embankments on the right of way.

As plans for this project began to take form and were presented to the Southern Pacific Railroad Company, we encountered a curious situation. The railroad officials were not even lukewarm about the project, it might even be said they were icy-cold. While years ago the railroad line to the city of Newport brought them in considerable profit with the then young city developing commercially and industrially, their business had dropped to almost nothing as the city of Newport Beach, including the Balboa peninsula and Balboa Island, became a recreational resort due to the splendid land-locked bay now world famous for the water sports it affords.

Statement was made by one of the railroad officials that they wished they could give up

GRADE SEPARATION SITE of Newport Beach project. The Coast Highway passes building in foreground and extends southerly around Newport Bay. Santa Ana road crosses just beyond railroad overhead.

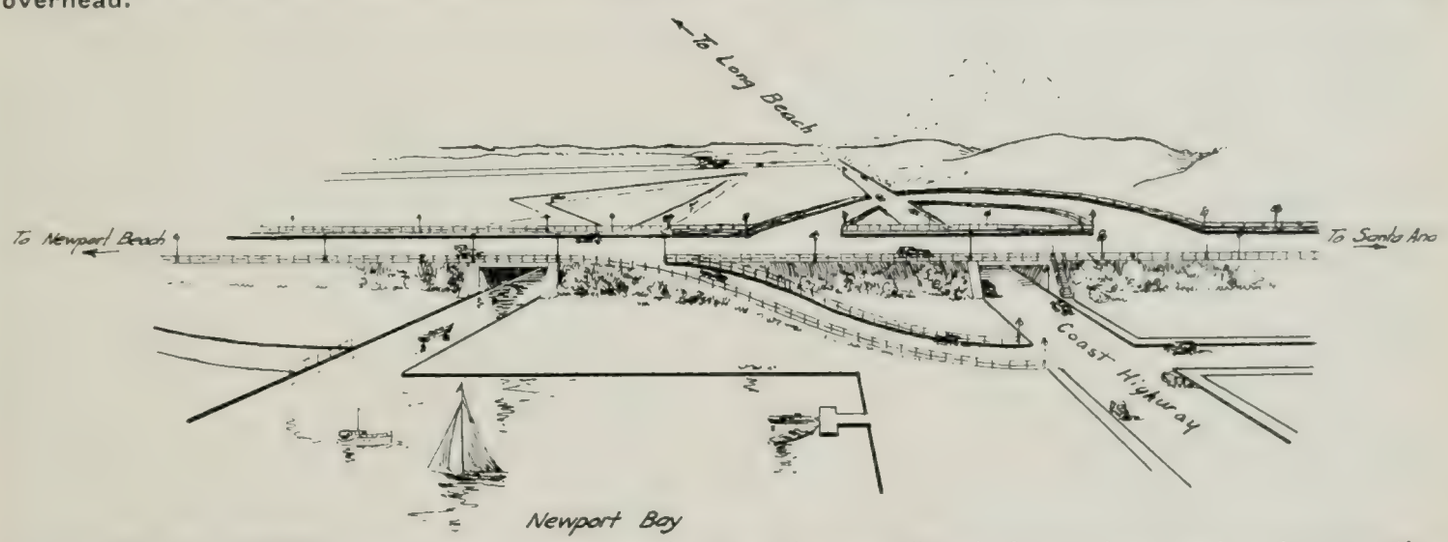


DIAGRAM SKETCH shows overhead crossing for Newport Beach-Santa Ana road and connecting ramps from the Coast Highway.

the Newport Beach line. Now, the abandonment of a long length of railroad (approximately eight miles) can not be accomplished in a day just by deciding it should be done. While local officials were agreeable to this suggestion from the start, the railroad company's board of directors, sitting back in New York City, had to be won over.

This was a most difficult task because the portion of the railroad right of way desired by the State was covered by a bonded indebtedness in excess of the amount the State offered for the right of way. Also, the matter had to be referred to the "Great White Father" in Washington through the Interstate Commerce Commission, because the Southern Pacific Railroad operates between States and the cutting off of a branch railroad from the main system might seriously affect interstate conditions. And so the working out of this proposition required many, many months of negotiation, before a successful agreement was reached so that the Newport-Santa Ana road could be moved over and occupy the railroad right of way.

There were also many other problems to be solved. Along the highway had been installed a large high-pressure water main carrying the water supply for the city of Newport Beach, the city of Laguna Beach, and other Orange County coast communities. There is also in the right of way a large high-pressure gas main which transports gas from the Ventura field to San Diego. Taking care of these important public utilities had to be worked out so that highway construction would not interfere or interrupt these most essential services.

(Continued on page 30)

Federal Aid Urged for Next Biennium

(Continued from page 9)

using the highways through special concession. A license to drive is but a privilege permit to operate on an asset owned by all the people.

Our highways are not built for individuals to use as they choose. Society in general and government retains the right to dictate the manner of use of the asset that is built by everyone. The 23,100 deaths on our rural highways and the 12,900 on our urban highways last year resulted from many causes. Of course, we want to know the cause to help find the remedy. But whether it be collision with pedestrians, collision with other motor vehicles, collision with railroad trains, with fixed objects, noncollision or any other cause, the American people should not view it with the apathy that seems to be public enemy number one.

Our highways may be the cause of some of these accidents but the engineer can not be shouldered with the responsibility. He is building the best highway and to the extent that revenue will permit, the engineer is doing his part in designing and building for safety by widening of curves, increasing sight distances, constructing extra lanes, installing signs and signals, putting down visible striping and many other things that science is devising in the interest of the highway user.

Now comes the responsibility of Mr. Citizen. If someone entered his home and murdered one of his family the greatest of interest would be manifested immediately. Mr. Citizen can cooperate with the constituted authorities through due observance of the laws if nothing else.

We have motor vehicles using our highways that are unfit for use and should be eliminated and a continuance of the practice now instituted in California of taking cognizance of those that have caused numerous accidents, even if they are minor, is going to be effective.

A strong resolution was passed by the association on this subject asking President Roosevelt and the governors of the several states to use their executive authority and to appoint advisory groups and direct existing official agencies to effect the cooperative action necessary to accomplish the desired results.

MORE FEDERAL AID URGED

California, like many of the states, wrote into its present biennium budget the full amount of the Federal Aid authorization as a part of the necessary funds to carry on the continuing process of highway construction within our boundaries. A strong resolution was passed by the association asking Congress to appropriate for highway construction for the fiscal years of 1938 and 1939 not less than $125,000,000 for each fiscal year, as well as other sums for the same period for forest highways, roads and trails, roads through public lands, nontaxable Indian lands, and other federal reservations; roads in national parks and for Indian reservation roads. In California authorizations and appropriations for these purposes are very necessary for a well connected highway system. May we hope that the members of Congress will be as highway-minded as they have been through making these appropriations in the past.

The unemployment situation in the United States has affected highway programs in all the states to a greater or less extent. Without the Federal Emergency appropriations many of the states would not have been able to make any showing to any extent during the past two years. The different states have worked with the greatest speed possible in a most efficient manner in the use of the Federal Emergency money for highway construction and railroad grade crossing eliminations. This has not only brought improvement years ahead of what would normally be possible but it has offered a channel providing profitable employment while constructing public improvements of a permanent character. All of this of course, has added to the civic and social values of the country.

EQUITABLE FUEL TAXES

The association offered a strong resolution pledging its continued support and assistance in the directing and expending of future Federal funds in an endeavor to meet the unemployment situation.

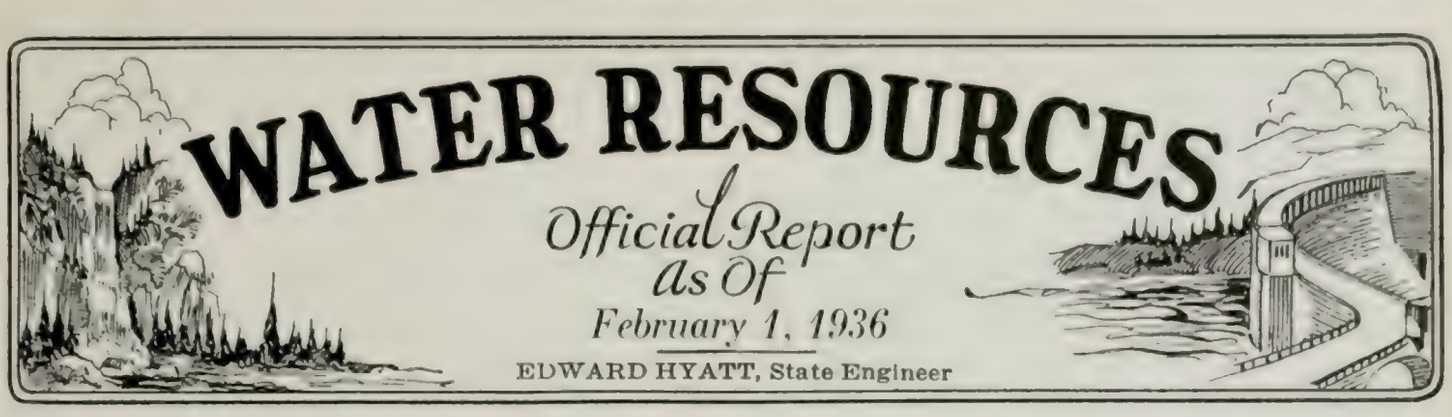
Another very important resolution that had wide discussion and was passed unanimously was a recommendation to the respective state legislatures that they take action to properly and equitably tax all motor vehicle fuels. Papers were offered and talks made on the new types of motors and the new development of motor fuels, other than gasoline, now being used in motor vehicles on our public highways. It was shown by many states that their revenue had decreased because of these fuels do not carry a tax and for that reason many users of our highways are not paying their proportionate share of the cost of construction and maintenance of our highways, roads and streets.

SAN FRANCISCO SEEKS CONVENTION

The association meeting was opened with a welcoming address by Governor Dave Sholtz of Florida in which he stressed the beauties and climate and other assets of his wonderful state. The representatives from California were particularly impressed with the Governor's reference to our own fair state. Realizing we were guests of the State of Florida and recipients of her very fine hospitality we listened with appreciation to the Governor's remarks and in true American sportsmanship and with due realization of how generous nature has been to our fair state we entered into the spirit of the occasion and did our part to make the convention one that will be known for specific accomplishments.

However, we felt California is ideally situated to entertain the representatives of the states in as wonderful a manner as Florida. San Francisco had asked us to present an invitation to the association to hold its 1936 convention in the city by the Golden Gate. This was done and we were not surprised when 90 per cent of those attending wanted to come to California.

If the executive committee in June officially accepts this invitation, Californians interested in highway matters will have an opportunity to meet, see and listen to the outstanding men of the United States working to move the people and trade on rubber wheels over paved highways.



Plans are being rapidly formulated for construction of the Central Valley water project by the U. S. Bureau of Reclamation. Both the Denver and local offices of the bureau are making every effort to get construction started at the earliest possible date, that the program may be carried out in accordance with the approval by the President in which he authorized an initial allocation of $15,000,000 for the construction of the project.

The tentative program adopted under the direction of Mr. Walker Young, engineer in charge of the project, contemplates construction being started on Kennett Dam on Sacramento River and the necessary relocation of the Southern Pacific railroad to replace several miles of the present line which will be flooded by the reservoir; the Contra Costa Conduit to serve industrial, urban and agricultural areas in Contra Costa County; Friant Dam on the San Joaquin River and the Madera and Friant-Kern canals which will divert water from the Friant reservoir to the lands in southern San Joaquin Valley.

The State Department of Public Works is cooperating in every possible way with the Bureau of Reclamation in speeding work on the project, and Governor Merriam has indicated his approval of $20,000 from the emergency fund to the Water Project Authority that it may effectively cooperate with the U. S. Bureau of Reclamation in furtherance of the project.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Routine maintenance was continued during this period, consisting of the removal of debris from bridges and structures, operation of pumping plants, levee patrol, minor repairs to structures, and filling cracks and gopher holes in levees.

During the small flood that began on January 13th, emergency work was done to hold the west levee of the Sacramento River above Colusa on the Clara Packer ranch. This work was done on January 16, 17 and 18 in cooperation with landowners, U. S. War Department, and WPA. Several of our WPA crews from other projects were transferred here during the emergency. The high water almost reached the levee top in places, but the chief trouble was occasioned by numerous gopher and squirrel hole leaks. The levee was safely held after a period of 48 hours of continuous work.

Relief Labor Work.

During this period aproximately 290 men were engaged on six WPA relief labor projects, clearing and improving the flood channels, principally in Sutter and Yuba counties. During the storm of early January much of the area on which these men were working was covered with water, but the crews continued to work on nearby levees. Some time was lost on account of rain.

Sacramento Flood Control Project.

Work has continued in preparing the right of way for the south levee of the American River near Perkins, the present work consisting mostly of installing irrigation pipes and removing hop support poles.

Work on the three new drainage pumping plants on the Sutter By-pass has been continued under contract with the California Debris Commission. Several of the new units have been installed and are ready for operation.

Several inspection trips were made with the U. S. Army Engineers on the Sacramento River between Colusa and Rio Vista, by boat, chiefly in the examination of the condition of caving banks.

Flood Measurements and Gages.

During the January storm flood measurements were taken at Coloma on the south fork of the American River, at Fair Oaks on the American River, and on the Bear River at Wheatland. The stages reached on the other streams were not sufficiently high to warrant measurement.

Automatic radio sending sets have been installed at gaging stations at Coloma on the south fork of the American River, at Rattlesnake Bridge on the north fork of the American River, and at Verona on the Sacramento River. These stations automatically transmit the river stages at fixed intervals and are located at the key stations which would largely determine the question as to whether or not the Sacramento weir gates should be opened.

DAMS

Application was filed January 15, 1936, for enlargement of the Sheffield Dam of the city of Santa Barbara. This is a small earth fill structure impounding water for municipal use, which is to be raised

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First Snow Survey Data Completed

(Continued from page 23)

approximately 12 feet and will store an additional 140 acre-feet. The estimated cost of the work is $95,000.

An amended application for repair of the Littlerock Dam located on Littlerock Creek and owned by the Littlerock and Palmdale Irrigation Districts, Los Angeles County, was filed December 23, 1935. The work contemplated covers alterations in the construction of temporary spillway works. This application was approved January 3, 1936.

Application for enlargement of La Patera Dam in Santa Barbara County was approved Janury 7, 1936.

Authorizations to use the Calero, Guadalupe, Vasona Percolating and Stevens Creek dams of the Santa Clara Valley Water Conservation District were issued December 21, 1935. Work on Coyote and Almaden dams has been considerably delayed because of the rains.

Work on Cajalco Dam of the Metropolitan Water District is progressing satisfactorily as is that at San Gabriel No. 1 of the Los Angeles County Flood Control District.

An order authorzing the use of San Gabriel No. 2 under certain restrictions as to storage was issued December 21, 1935.

Enlargement of the O'Shaughnessy Dam of the city of San Francisco is proceeding.

Repairs and alterations on the American River Head Dam and Lake Francis Dam, both belonging to the Pacific Gas and Electric Company, have been satisfactorily completed.

Repairs on St. Helena Lower Dam have been delayed on account of heavy rains in the vicinity.

The PWA has available, funds for the repair of Lake Hodges Dam of the city of San Diego and the state has been assured the work will be commenced shortly.

The usual maintenance and operation inspections have been carried on in addition to the inspections of repair and construction work.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work has continued during the past month on compilation of the 1935 Report covering diversions, stream flow, and return flow in the Sacramento-San Joaquin territory and salinity in the Delta.

In the field, the tide gages and salinity sampling at permanent stations in the Delta have been maintained.

From a flow in the Sacramento River at Sacramento of about 9500 second feet in the latter part of December, the recent storms brought the flow to a maximum on January 16th of about 75,000 second feet plus the additional flow in Yolo Bypass.

The increased stream flow is reflected in a marked recession of salinity which had dropped to 6 parts of chlorine per 100,000 at Collinsville and Antioch on January 14th.

CALIFORNIA COOPERATIVE SNOW SURVEYS

Work during the past month has been in the office in bringing up to date the computation of normals for both precipitation stations and snow courses and in compiling natural stream flow records for correlating the past snow survey data.

The first snow surveys for the season were made at key courses at the end of January and the data of these surveys together with precipitation records to date will be published in the first monthly bulletin to be ready on February 10th.

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty applications were received during December to appropriate water; 13 were denied and 11 were approved. In the same period 12 permits were revoked and 7 passed to license.

A total of 1479 reports were filed between October 15th and January 1st covering developments under permits and licenses issued by the Division. These reports are under study with a view to determining what extensions should be allowed, what inspections should be made and what abandonments have occurred.

Water Distribution.

Reports covering distribution of water in the following districts for the 1935 season are being prepared: Hat Creek, Burney Creek and Cow Creek Water Master Districts (Shasta County), Owl, Soldier, Emerson, Cedar, Deep and Mill Creek Water Master Districts (in Surprise Valley, Modoc County); New Pine, Davis and Franklin Creek Water Master District (in Goose Lake Valley, Modoc County); Shasta River Water Master District (Siskiyou County).

Reports covering the distribution of water in the following districts for the 1935 season have been completed: South Fork Pit River, Pine Creek, and Hot Springs Valley Water Master Districts (Modoc County); and Big Valley Water Master District (Modoc and Lassen counties).

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Final sheets of the Hoaglin Quadrangle are now available. This covers an area in southern Tehama County. The sheet is published on a scale of 1:125,000 with a contour of 100 feet. Final sheets are also available of Woody Quadrangle in Kern County. This is published on a scale of 1:62,500 with a contour interval of 50 feet.

REDLANDS DEDICATION GROUP—In the official party (left to right) State Highway Commissioner C. D. Hamilton, Mayor William Fowler, Secretary Horace Williamson, Chamber of Commerce; Chairman Harry A. Hopkins of Highway Commission, District Engineer E. Q. Sullivan, Miss Jessie Reynolds, Director of Public Works Earl Lee Kelly, Mayor Harford of Colton; Mayor Funk of Beaumont, Mayor Johnson of San Bernardino.

Highway Sponsor Sees Dream Realized

(Continued from page 4)

coffers had been diverted, this modern highway, a milestone in the development of Redlands, could not have been possible. We of the state are thankful that the highway could be completed at so early a date."

The new highway runs through the heart of the municipal dump. E. Q. Sullivan, district engineer, who supervised construction with the cooperation of City Engineer George Hinckley, said that plans have been made to beautify the route with trees, shrubbery and flowers where it passes through the dump thus providing an attractive entrance to Redlands.

Among those on the speakers' platform to whom the improvement meant a lot was Isaac Ford of the city planning commission. Ford is credited with having conceived the new highway and sponsored the movement for it.

"I am glad my dream has come true," he said.

Mayor Will Fowler of Redlands opened the dedication ceremonies and told of the city's efforts over a period of years to bring about the improvement.

Highway Commissioner Hamilton praised Redlands for its united work in pushing the work of the highway link to completion.

As president of the Redlands chamber of commerce, Horace S. Williamson give a full measure of credit to the state for the construction of the project.

THREE VISITING MAYORS PRESENT

Officials of neighboring cities joined with Redlands in celebrating the opening of the new road. Mayor E. F. Harford of Colton headed a delegation which included H. W. Roller, city councilman; John Cook, chamber of commerce president; and Otto B. Kessler, secretary of the chamber.

Mayor Johnson of San Bernardino, Mayor J. D. Funk of Beaumont and Mayor Harris of Banning represented their cities at the ceremonies.

A civic Rotary Club luncheon preceded the dedication.

Troop 21, Redlands Boy Scouts, took part in the opening.

Clearing 1100 Miles of Roadsides

(Continued from page 10)

Due to the rapid growth and uncertainty as to weather, careful planning is necessary and it is possible, at best, to cover only a portion of the areas at the ideal time.

Experiments have been carried on—in one case extending over several years—to determine the most effective nonpoisonous material. Various proprietary chemicals were included in these tests. Nothing was discovered, however, that was more effective or as economical as Diesel oil having the following specifications to insure a uniform material of adequate toxic effect:

Specific gravity (A. P. I.) at 60°F_____
_____not less than 27°Be
Flash point (Penskey-Martin closed cup)____
_____not less than 150°F
Viscosity (Saybolt Universal) 100°F_____
_____not more than 50 seconds
Distillation—90% point_____not over 680°F
Water and sediment_____not more than a trace

The Diesel oil is applied at the average rate of one-tenth gallon per square yard of area to be treated by means of tank truck outfit equipped with pressure pump and spray bar. The spray bar is fitted with orchard type spray nozzles designed to give a uniform spread.

To insure such a spread, it is necessary that the position of the spray bar be adjustable so that it may be readily raised or lowered and reach out to varying distances from the roadway. Various designs have been used to serve the purpose. The pictures on page 11 illustrate the general idea.

WORKERS HELD RESPONSIBLE

After the oil is applied, it is allowed to penetrate and act on the vegetation, which gradually turns brown. Burning operations, if required, are then started.

Under existing legal restrictions, any damage which results through negligence of an individual in the State service is a direct responsibility of that individual. Special care is taken, therefore, to see that adjoining property, fence posts, trees, etc., are properly safeguarded, as well as provision made for the protection of traffic. Knapsack type pumps or fire trucks are provided for each crew, and flagmen warn and direct traffic.

The cost of spraying averages from $50 to $60 per road mile of two 9-foot strips, and burning operations cost about $20 per road mile, or a total of $75 to $80.

In addition to the areas where spraying is necessary, a considerable mileage is also protected during the regular maintenance operations by blading, disking, or mowing. Protection by this means is considerably cheaper in first cost, averaging about $6 per road mile for a reasonable width.

SERIOUS FIRE ABATED

Any grading operation, however, has the disadvantage of disturbing the road section and loosening the soil to wind and water erosion so that the ultimate cost, considering damage done and discomfort due to dust nuisance, may well exceed the cost under the spraying method. There are many locations, also, where it is not possible to work equipment, and such areas must be sprayed.

There is no question as to the beneficial results of this work. Prior to the initiation of this protective measure, a number of serious fires could be anticipated each season. Last year not a single fire of any magnitude was reported as having started along the State highway.

$650,000 VIADUCT IN LOS ANGELES

(Continued from page 12)

The erection of the unusually long steel plate girder spans, which will span the tracks and the Los Angeles River will also be an interesting construction problem.

The contract for the viaduct has been awarded to the low bidder on a bid price of $578,420. However, supplemental work to be accomplished by the Southern Pacific Company, in addition to a contingency item, will bring the cost of this project to approximately $678,000. The contract provides for 300 working days in which to complete the viaduct.

The North Figueroa Street road, tunnel and viaduct projects will provide a continuous through artery for traffic to and from the rapidly developing areas across the river at the north, northwest, and northeast of Los Angeles.

Highest and Lowest Spots in U. S. Linked Closer by Highway

(Continued from page 16)

among these peaks is Mount Whitney, the highest peak in the United States proper.

At this spectacular viewpoint the casual visitor does not realize that a few miles distant in Death Valley, reached in an hour's comfortable drive by way of the recently improved highways, lies Bad Water, the lowest spot in the continental United States with an elevation of 279.8 feet below sea level.

SCENE OF PIONEER TRAGEDY

Bad Water is of particular interest as it is the termination of the Amargosa River, the disappearing stream of Death Valley, and the spot where a number of early immigrants trapped in the floor of the valley rushed to partake of the crystal clear water only to die in agony a few hours later, because this water is abnormally charged with salts and minerals.

Probably in no section of the state has the improvement of the Secondary Highway System brought more prompt and beneficial results to the scattered inhabitants of the region, to the people of California, and to visitors from states beyond our borders, than the work done by the Department of Public Works in this area and by the National Park Service within the borders of the Death Valley National Monument.

Many thousands of motorists who had deferred a trip through this picturesque yet awesome wonderland until such time as the highways were in a condition to be traveled with comfort and safety have been able to enjoy a new and exotic touring experience.

AUTOS COVER 16 BILLION MILES

The nation's 25,000,000 motor vehicles rolled up an aggregate mileage last year that reached the astronomical proportions of nearly two hundred billion miles, according to figures reported in a nation-wide study. In California the estimated total of motor vehicle mileage in 1934 was 16,111,000,000 miles, the second highest among the states. New York was first with about twenty billion miles.

California made a gain of 5.66 per cent in motor vehicle registrations in the first nine months of last year in comparison with the same period of 1934.

New Tunnel Provides Traffic Outlet From Crowded Beach Area

(Continued from page 6)

the heart of Los Angeles providing a direct outlet for city-bound traffic from the beach.

Mr. Kelly then, as Director of Public Works for the State of California, without further ceremony declared the tunnel open for traffic.

Mayor Carter of the city of Santa Monica expressed regrets over the necessity of canceling the festivities due to the inclement weather and emphasized the benefits which Santa Monica would enjoy from the completion of the tunnel.

Expressions of appreciation were extended to the officials for their splendid cooperation and in conclusion the mayor commanded Chief of Police Webb of the city of Santa Monica to have the final barricade removed and allow traffic to use the tunnel.

The municipal band played the national anthem and at its conclusion, cars were allowed to pass through.

Previous to the outdoor ceremony, the state and county officials met with Santa Monica heads and civic and business leaders at a luncheon in the Del Mar Club held under the auspices of the Olympic Boulevard Improvement Association.

With Supervisor Quinn acting as toastmaster, the luncheon program included brief speeches by Director Earl Lee Kelly, District Engineer S. V. Cortelyou, Justus F. Craemer, Assistant Director of Public Works; D. W. Pontius, president of the Pacific Electric Railway; G. T. McCoy, Assistant Highway Engineer, and Fred Grumm, Engineer of Plans and Surveys.

Mr. Pontius in his remarks stated that: "This is the greatest highway project completed in the entire state in several years and it means more to the Santa Monica Bay district than anything else that could be accomplished."

First Angler: "I caught a fish so big that my friends wouldn't let me pull it aboard for fear the boat would be swamped."

Second Angler: "I quite believe you. I once had a similar experience aboard the Mauretania."

Wife—Did you notice the wonderful coat the woman had on who was sitting in front of us in church this morning?

Husband—No; I'm afraid I was dozing.

Wife—It does a lot of good to take you to church, doesn't it?

State Exhibit at San Diego Fair to Show Highway Safety Features

THE DIVISION of Highways of the Department of Public Works, will contribute its share toward the success of the 1936 edition of the California Pacific International Exposition at San Diego by continuing an exhibit depicting some of the more interesting phases of its many activities and services to the motoring public of California. During the 1935 Exposition, over 1,700,000 persons viewed the Highway Exhibit in the State Building.

Among the many interesting features in this exhibit is the one showing side by side sectional models of the famous Appian Way of ancient Rome and of a modern highway. Colored lights and explanatory captions present interesting and informatory comparisons between the methods and processes of the ancient highway builders of Appius Claudius and the modern practices used in the construction of California's unexcelled highway system.

WORK REQUIRED 280 YEARS

Here are presented the historical facts of that first and justly famous effort of government to provide for its citizens an artery of commerce and a life line of protection in time of war, for its far-flung empire.

The Appian Way was begun by the Censor Appius Claudius in 312 B.C. and for over 280 years, this far-sighted emperor and his successors labored toward its completion. When completed it extended from Rome to Brundusium, a distance of 350 miles. Massive in plan, and constructed to endure for ages, the effort appears feeble indeed when compared to California's highway system extending over 13,605 miles, of which there is hardly a mile that is not incomparably better than this ancient road.

Especially does the comparison appear invidious when it is realized that less than one-tenth of the time required to construct the 350 miles comprising the Appian Way has been utilized in the construction of the mighty modern road system which is justly California's pride.

Among the many interesting facts obtained from visitors to the highway exhibit during the 1935 exposition was the universal impression made by California's road system upon visiting motorists from other states and territories. Few indeed failed to pause and remark to the exhibit attendants upon the lasting impression our fine roads had made upon them.

The exhibit planned for this year's fair is to be expanded by the addition of an informational and interesting exhibit of the standard system of highway signing which has been developed for the safety, information, and direction of the motoring public.

In conjunction with and supplementing the sign exhibit, it is planned to present a complete pictorial exposition of the multitude of safety refinements developed by California's road builders in the design, construction and maintenance of our highways.

SAN MATEO COUNTY CLUB EXPRESSES APPRECIATION FOR ROAD IMPROVEMENT

Sky L'Onda Improvement Club
San Mateo County, January 27, 1936.

Division of Highways,
Department of Public Works,
Sacramento, California.

Gentlemen:

The officers and members of the club take this opportunity to thank your department for the wonderful work you have done on the stretch of road from Redwood City to the Sky Line Boulevard.

The amount of improvement noted in the short length of time since your department took charge, is phenomenal, and your Mr. Grosser, who we understand is directly in charge of this work, is to be commended for his foresight in improving the worst spots before our winter weather set in.

This work was carried on entirely without interruption or hindrance to travel, due to wise planning and handling of equipment, which is quite a task on a road as narrow as this one.

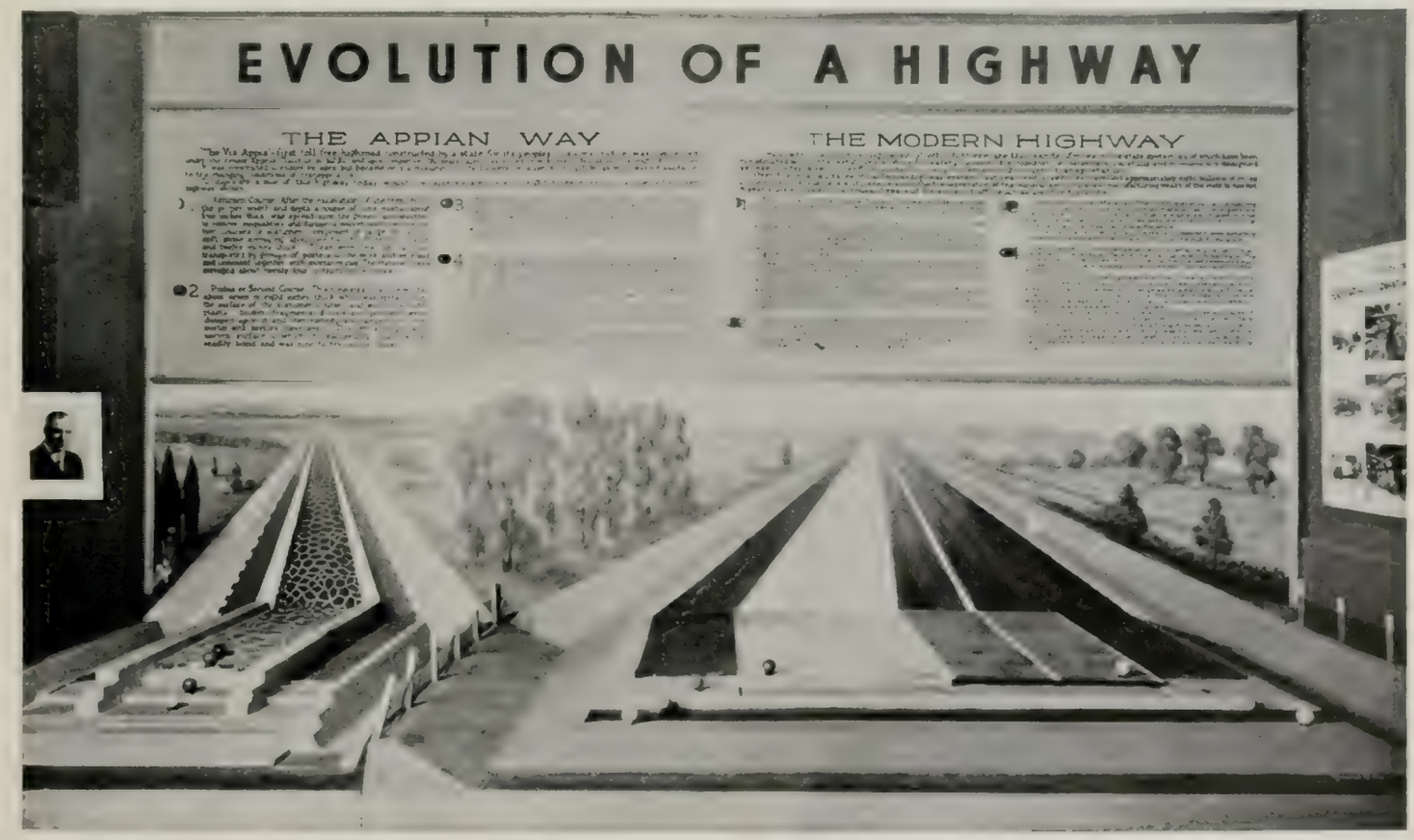
Please believe us when we say that people of Sky L'Onda are very grateful to your department.

Very truly yours,

(Signed) A. J. TURNER, President

E.F.Mc.

SAN DIEGO EXPOSITION EXHIBITS—The old, much dreaded plank road over the desert to Yuma is realistically reproduced, affording visitors a comparison with the wide, modern, surfaced highway that the State has built, providing safe traffic through the ceaselessly shifting sand dunes.



ANCIENT AND MODERN HIGHWAYS are compared in this exhibit of the Appian Way built by the old Roman engineers and a standard present day arterial as California engineers build it. The models show every step from foundation up to top layer surfacing.

Grade Separation at Newport Beach Now Under Construction

(Continued from page 21)

As the project developed many improvements were added to the original scheme. A system of side road ramp connections was worked out so that there will be a free flow of traffic in all directions whatever the destination may be of vehicles coming into the grade separation.

LIGHTING SYSTEM ADDED

As the plan work neared completion Pat Patterson brought into the district office a design for an electric lighting system, which he advocated be constructed for the city of Newport Beach as a part of the State contract. This was the last addition to the plans, and now decorative electroliers will be evenly spaced, so that the entire project will be well illuminated and safe for night driving.

The accompanying perspective drawing is an attempt to show the completed structure. Like all plans of the Newport Beach grade separation, it has been subjected to many changes since first drawn for Mr. Strobridge by Will Sharpe, an Alhambra artist.

And so the Newport Beach grade separation project has passed out of the "conversation stage," and is now under construction. The estimated cost, including the channel bridge, the highway overhead bridge, all ramp connections, and incidental work to complete the project, is approximately $170,000. The work is scheduled for completion in September, 1936. When completed, this structure will stand as a monument to effective and wholehearted cooperation.

The traveling public journeying in the vicinity of Newport Beach find a traffic facility that will greatly add to their comfort, convenience and safety, and save them many wearisome and nerve-racking delays. During the long planning period every advantage was taken of new developments and of experiences gained by traffic flow studies at that location and elsewhere, and many most desirable additions and refinements have been carried into the plans which could not possibly have been worked out if the project had been forced-drafted to maturity more quickly.

One Wife: "When you and your husband quarrel, do you threaten to go home to your mother?"

Another: "No, indeed, I threaten to have mother come here."

State Highways Used Most in Both Rural and Municipal Areas

THE preponderant use which traffic makes of the state highways is not confined to either the urban or rural areas. It is outstanding in both, according to data on road transportation in California gathered for Director of Public Works Earl Lee Kelly.

Where one car is found on a mile of county road, fifteen are found on the rural state highway; and in the cities, six times as many cars will travel over the urban portion of the state highway as will be found on an equal mileage of the other municipal thoroughfares.

MOST VEHICLE MILEAGE

The aggregate population and road mileage of the five counties of Alameda, Los Angeles, San Diego, San Francisco and San Mateo are 63.5 per cent and 20.9 per cent of the state totals for these respective items.

The aggregate vehicle miles occurring in these counties are 58.6 per cent of the state total; in fact, in Los Angeles County alone is 42.2 per cent of the combined state vehicle mileage.

Of the large proportion of traffic in this group of five counties, 30.6 per cent of the vehicle mileage is on state highways, 8.2 per cent on county, and 61.2 per cent on municipal thoroughfares.

Truck Owners Must Pay Bridge Damages

The fact has now been legally reaffirmed that law violators are responsible for damages to State highways and that the duty of the Department of Public Works to care for and protect State highways is not limited to physical maintenance by the Department. Such duty, the court recognizes, also includes the collection of the costs of making repairs made necessary by the illegal operation of vehicles on the State highways.

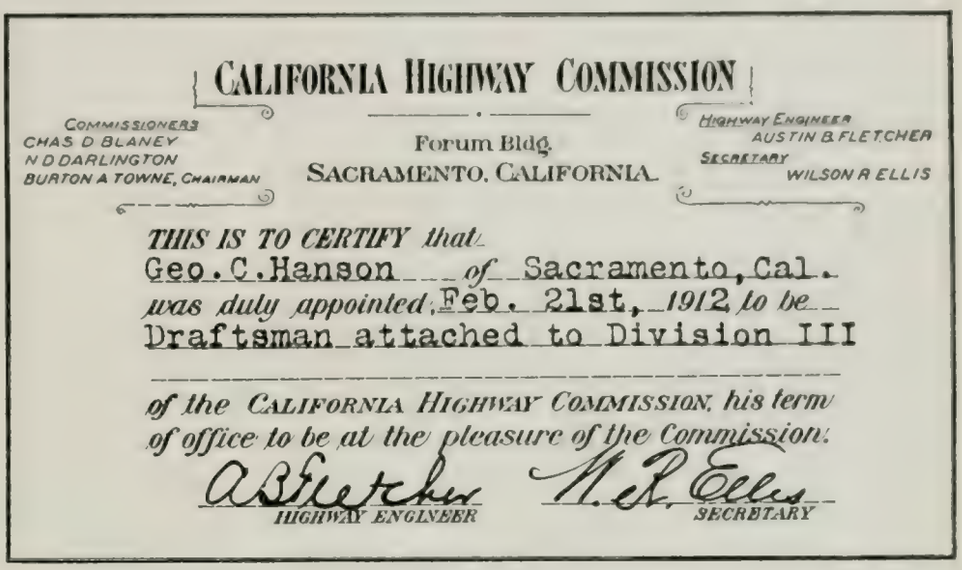
In recent months the department has recovered judgments against two truck operators for damages to bridges, one in Shasta County and one in Monterey County. In the latter case an over-height load was driven onto a bridge across the Salinas River at Soledad with such force as to require reconstruction of one-half of the entire bridge.

Old Timer, Do You Hold a Card to Beat This?

ANOTHER applicant for membership in the Old Timers' Club of the State Division of Highways holding an identification card dated way back in February, 1912, reported in this month.

He is George C. Hanson of Sacramento. While a close runner-up for the honor of head man of the club, Mr. Hanson did not displace George Mattis of Emeryville, who last month submitted credentials showing that he was appointed Chief Assistant of the old Division V of the Highway Commission on February 1, 1912. Mr. Hanson went to work as a draftsman for the commission on February 21st of the same year.

While he did not win the post of oldest member in point of years elapsed since his original appointment, Mr. Hanson has a distinction of his own. He has a record of 24 years of uninterrupted service with the Division of Highways.



CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON A ELLIS

THIS IS TO CERTIFY that
Geo. C. Hanson of Sacramento, Cal.
was duly appointed Feb. 21st, 1912 to be
Draftsman attached to Division III

of the CALIFORNIA HIGHWAY COMMISSION, his term of office to be at the pleasure of the Commission.

A B Fletcher
HIGHWAY ENGINEER

W. A. Ellis
SECRETARY

TWENTY-FOUR YEARS' SERVICE began for George C. Hanson when he received this card and went to work for the State March 1, 1912.

WORKED IN OLD OFFICE

The only requirement for membership in the Old Timers' Club is possession of one of the identification cards issued by the old Highway Commission in 1912 and thereafter to every man appointed on the staff of a division engineer. Mr. Hanson sent in his card and with it a photograph of himself taken when the commission had offices for the employees of District III in the California Fruit Building in Sacramento.

In applying for membership, Mr. Hanson wrote:

"I have been much interested in the articles in California Highways and Public Works about the Old Timers' Club and the contest for the oldest certification card.

"While mine probably is not as ancient as some others, its date of February 21, 1912, should at least attain honorable mention.

"I actually went to work as a Draftsman in Central Office on March 1, 1912. I have been employed by the Division of Highways for close to 24 years of continuous service."

ON THE JOB, twenty-four years ago. George C. Hanson (left) and H. C. Stover, now designing engineer of bridges, then starting as a draftsman.

Highway Bids and Awards

for January, 1936

KINGS COUNTY—Between 2 miles south of Lemoore and 1½ miles east of Stratford. About 6.3 miles in length, shoulders to be graded. District VI, Lemoore Road. L. A. Brisco, Arroyo Grande, $18,365; Claude C. Wood, Stockton, $19,165; Stewart & Nuss, Inc., & John Jurkovich, Fresno, $19,465; Earl W. Heple, San Jose, $19,644; M. J. B. Construction Co., Stockton, $22,679; Rexroth & Rexroth, Bakersfield, $23,032; Oilfield Trucking Co., Bakersfield, $23,344. Contract awarded to Leo F. Piazza, San Jose, $18,127.75.

LOS ANGELES COUNTY—Undergrade crossing under Union Pacific R. R. at Soto St. in Los Angeles, about 0.22 mi. roadway to be graded and paved with P. C. concrete. District VII, Route Feeder, Section L.A. H. M. Baruch Corp., Ltd., Los Angeles, $172,109; Basich Bros., Torrance, $159,634; Griffith Co., Los Angeles, $156,284; R. E. Campbell, Los Angeles, $193,-311; Merritt Chapman & Scott Corp., San Pedro, $179,164; Carlo Bongiovanni Const. Co., Hollywood, $189,990; T. A. Allen Const. Co., Los Angeles, $156,-691. Contract awarded to Oscar Oberg, Los Angeles, $154,942.70.

LOS ANGELES COUNTY—In San Gabriel Canyon between Camp Bonita and Follows Camp. About 2.2 mi, graded and A St. string br. to be constructed. District VII, route feeder, Section San Gabriel Canyon. Granfield, Farrar & Carlin, San Francisco, $368,394; Basich Bros., Torrance, $399,094; Oswald Bros., Los Angeles, $442,219. Contract awarded to Guy F. Atkinson Co., San Francisco, $355,762.

LOS ANGELES COUNTY—Los Angeles Railway and Southern Pacific R. R. overhead crossing at Figueroa Street and about 0.23 mi. roadway to be graded and paved with A. C. pavement. District VII, Route 165, Section L.A. Bent Bros., Inc., Los Angeles, $620,547; C. W. Calletti & Co., San Rafael, $632,860; Griffith Company, Los Angeles, $646,061; Mittry Bros. Const. Co., Los Angeles, $627,253. Contract awarded to Clinton Const. Co. of Calif., Los Angeles, $578,420.

LOS ANGELES COUNTY—Overhead crossing over Valley Boulevard and Southern Pacific R. R. at Soto St. and approx. 0.62 mi. to be graded and paved with A. C. District VII, Route Feeder, Section L.A. Heuser & Garnett, Glendale, $126,445; Bent Bros., Inc., Los Angeles, $133,911; Merritt-Chapman-Scott, Corp., San Pedro, $127,021; Robert E. McKee, Los Angeles, $135,-330; Byerts & Dunn, Los Angeles, $132,224; Lynch-Cannon Eng. Co., Los Angeles, $128,863; Atlas Construction Co.-C. F. Robbins, Pasadena, $136,863. Contract awarded to Griffith Co., Los Angeles, $116,864.70.

LOS ANGELES COUNTY—Undergrade crossing under Pacific Electric Ry. at Mission Road in Los Angeles. District VII, Route Feeder, Section L.A. Bodenhamer Constr. Co., Oakland, $273,900; Mittry Bros. Constr. Co., Los Angeles, $324,072; J. E. Haddock, Ltd., Pasadena, $245,917; R. E. Campbell, Los Angeles, $264,976. Contract awarded to L. E. Dixon Co., Los Angeles, $241,661.

MENDOCINO COUNTY—Near Lane's Flat. Widen, surface with river run gravel and place C. M. P. and D. I. a length of 0.2 mile. District I, Route 1, Section J. C. W. Caletti & Co., San Rafael, $8,556; John Burman & Son, Eureka, $7,901. Contract awarded to Helwig Const. Co., Sebastopol, $5,688.

NAPA COUNTY—Construct maintenance station buildings, at yard, about ½ mile north of Napa. District IV, Route 49, Section B. Theo. Johanns, Yuba City, $8,290; A. H. Siemer, San Anselmo, $7,263. Contract awarded to C. G. Langum, Napa, $7,194.

NAPA COUNTY—Between St. Helena and Larkmead Station 6.3 miles, grade and bridge. District IV, Silverado Trail. Pacific States Construction Co., San Francisco, $82,723; Bodenhamer Const. Co., Oakland, $86,867; Heafey-Moore Co., Oakland, $88,313; Granfield-Farrar and Carlin, San Francisco, $89,444; J. A. Casson, Hayward, $89,794. Contract awarded to Union Paving Co., San Francisco, $67,523.50.

ORANGE COUNTY—South Main Street between Delhi Road and Fairview Avenue, 1.3 mi. grade and P. C. C. pavement. District VII, Route 184, Section S.A. Basich Bros., Torrance, $45,753. Contract awarded to C. F. Robbins, Los Angeles, $42,487.

RIVERSIDE COUNTY—Between 10 miles west of Indio and Indio. About 10.9 miles in length to be graded and treated with liquid asphalt and a timber pile trestle to be constructed. District XI, Route 64, Section Q & Indio. Basich Bros., Torrance, $146,795; J. E. Haddock, Ltd., Pasadena, $154,223; Dimmitt & Taylor, Los Angeles, $150,868; V. R. Dennis Const. Co., San Diego, $138,132; Gibbons & Reed Co., Burbank, $155,330; Griffith Co., Los Angeles, $198,247; Geo. Herz & Co., San Bernardino, $146,830; Matich Bros., Elsinore, $143,235; Granfield, Farrar, & Carlin, San Francisco, $185,410; Oswald Bros., Los Angeles, $141,640. Contract awarded to Sharp & Fellows Cont. Co., Los Angeles, $129,848.90.

SAN BENITO COUNTY—Between Bear Valley and 1 mile of Willow Creek, 3.1 mile, grade, Sel. Mtl. Base, Rdmix Surf. and Tim. Br. District V, Route 119, Section C. Gibbons & Reed Co., Burbank, $101,295; Chas. Harlowe, Jr., Oakland, $108,436; Hemstreet & Bell, Marysville, $91,925; A. Teichert & Son, Inc., Sacramento, $84,102; C. F. Fredericksen & Sons, Lower Lake, $92,034; Heafey-Moore Co., Oakland, $100,272; J. L. Conner, Monterey, $85,950; Peninsula Paving Company, San Francisco, $94,500; Young & Son Company, Ltd., Berkeley, $88,391; M. J. B. Construction Co., Stockton, $93,725. Contract awarded to Union Paving Co., San Francisco, $85,187.50.

SANTA CLARA COUNTY—In Santa Clara undergrade crossing, Southern Pacific R. R. District IV, Lafayette Street undergrade crossing. Macdonald Kahn Co., Ltd., San Francisco, $168,127; A. J. Raisch and A. G. Raisch, San Francisco, $159,114; Eaton & Smith, San Francisco, $168,945. Contract awarded to Barrett & Hilp, San Francisco, $152,897.10.

SHASTA COUNTY—Borings at site of bridge over Pit River. District II, Route 3, Section B. Diamond Drilling Co., San Francisco, $4,240; Chicago Pneumatic Tool Co., San Francisco, $4,131; Milton A. Purdy, Oakland, $4,647; Cannon Brothers, Compton, $3,945. Contract awarded to Daniel G. Longtin, San Francisco, $3,301.40.

SUTTER COUNTY—In Yuba City, Plumas Street between Bridge Street and Scott Street, about 0.1 mile to be graded and paved. Curbs and gutters constructed. District III, Route 3, Yuba City. C. R. Fesler, Yuba City, $3,331; Louis C. Siedel, Sacramento, $3,236. Contract awarded to Leo F. Piazza, San Jose, $2,589.34.

TEHAMA COUNTY—One-half mile south of Red Bluff undergrade crossing, Southern Pacific R. R. 2 R. C. Abuts. Steel Sup. Str. 0.45 mi. P. C. C. Pav. District II, Route 7, Section B. C. W. Calletti & Co., San Rafael, $93,203; Paul J. Tyler & Lord & Bishop, Sacramento, $93,516; A. Teichert & Son, Inc., Sacramento, $102,695; McDonald Kahn Co., Ltd., San Francisco, $112,550. Contract awarded to N. M. Ball Sons, Berkeley, $91,790.

Excited Young Father: "Quick! Tell me! Is it a boy?"

Nurse: "Well, the one in the middle is."

—Daughters of America Magazine

Husband (after the theater): "But, dear, what did you object to?"

Wife: "Why, the idea of you bellowing 'Author! Author!' at a Shakespearean drama!"

—The Christian Science Monitor

Theysitlikethisuponaseat,
And now and then they kiss;
Then she says some darn fool thing,
And then they sit
Like_____this.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

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Port of Eureka—William Clark, Sr., Surveyor

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SACRAMENTO, 1936

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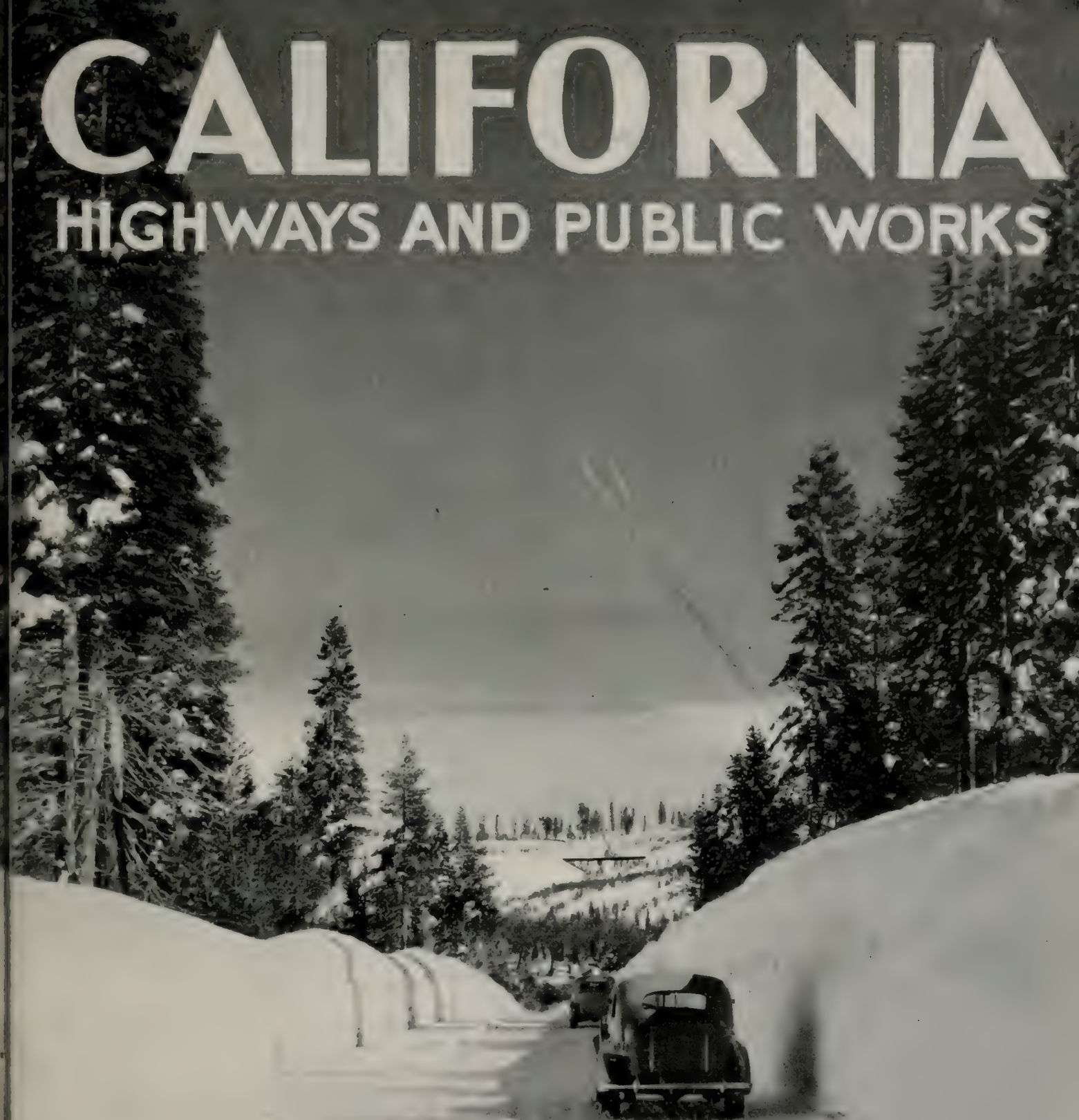
FEB 2

MAP
SHOWING
STATE HIGHWAY SYSTEM

Seattle Public Library

CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



State Route No. 37 (U.S. 40) over Sierras
Cleared by Snow Plows

Official Journal of the Department of Public Works

MARCH • • 1936

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Traffic Accident Study Reveals

Major Highway Casualty Factors Are

Bad Driving, High Night Speeds

and Pace Differential Between Trucks and Autos

By **T. H. DENNIS,** Maintenance Engineer

FOR several years governmental officials charged with the construction and maintenance of roads and streets and the control of traffic have been perplexed at the attitude of calm acceptance with which the motorists have taken accidents.

There is valid evidence to show that in California motor vehicle accidents vary directly with the volume of traffic, and this despite progressive improvement of roads. There is also a considerable volume of evidence to show that only a small percentage of the accidents are due either to the physical condition of the roads or to the mechanical condition of the vehicles.

The responsibility for a predominant majority of the cases rests upon the drivers of the vehicles and it is their apparent disinterest which has complicated the solution of the traffic accident problem.

T. H. DENNIS

Within the past year there has been a notable quickening of public opinion and a distinct effort to awaken the general public to a realization of what is occurring. Newspapers, radio and magazines have pounded at the matter and a much more lively interest has been the result.

The extent to which this new interest may be sustained and made effective in reducing the accident rate will depend largely on the development and adoption of a preventive program combining the forces of legislation, enforcement, and education.

Realizing the difficulties of successfully coordinating the activities of many unrelated groups, various interested citizens urged the Director of Motor Vehicles to set up two committees composed of those particularly interested in the subject of accident prevention. The first of these committees is composed of representatives of governmental agencies having a direct interest in the administration of roads, streets, and traffic.

This administrator's committee is composed of representatives of the State Board of Education, the Attorney General's office, the League of Municipalities, State Industrial Accident Commission, Department of Motor Vehicles, and Department of Public Works. This committee is under the chairmanship of the Director of Motor Vehicles.

The second committee acts in an advisory capacity and it is composed of representatives of local groups, acting through subcommittees on legislation, enforcement, education, and engineering.

In addition to constituting a coordinating body, one of the prime functions of the administrators' committee is to collect and analyze data on automobile accidents and to determine, with the assistance of the

(Continued on page 4)

MAR 2 5 1936

Donner Summit Closed Only 34 Hours During a 24-Day Snowstorm Period

By **C. H. WEEKS**, Maintenance Superintendent

NOT SINCE the state inaugurated snow removal operations on the Donner Summit route over the Sierra Nevada has the Maintenance Department of the Division of Highways been called upon to combat such storm conditions as it encountered in that area last month.

A total of 161 inches of snow fell on the Donner Summit route during 24 days in February. Except for five days of good weather and time out for servicing and repairing equipment, all the snow fighting machinery of the Maintenance Department in that section was operated continuously throughout the storm period.

The mountain highway was closed to all traffic for only 34 hours during the entire month due to poor visibility, drifting or snow slides on four separate occasions.

Trucks were held up on six occasions for a total of 111 hours. The snow removal equipment went through continuously except for about 16 hours on February 24 and 25 while the rotaries removed heavy snow slides.

SLIDE ENDANGERED TRAFFIC

With the exception of the period between February 4 and 9, the entire month was very stormy and windy. The 161 inches of snow made twice the fall in depth and three times the amount measured as precipitation for any February since the inception of snow removal work on this route.

In addition to combating the regular snow conditions, maintenance crews had to contend with a dangerous slide which developed just west of Baxter's. At several points the road slid away to such an extent that half the traveled way was unsafe. Flagmen protected traffic at these slides at all times.

The storm came up suddenly on February 1 and, due to poor visibility, all heavy truck traffic over the summit was stopped between 6 p.m. and 11 p.m. Snowfall ceased during the night of February 3 and for five days we had the only fair weather enjoyed during the month.

Due to extremely cold nights, the snow and ice packed on the highway did not melt to any appreciable extent and motorists were required to use chains.

BLIZZARD-LIKE STORM

On February 11 the big storm broke and did not subside until the 26th. At one time the wind reached a velocity of 64 miles an hour. The maximum temperature recorded was 48 degrees above zero and the minimum was 16 degrees below.

At 8.20 a.m. on February 12 all westbound trucks were stopped and at 1 p.m. the same day eastbound trucks were halted at the Baxter gate. This precaution was taken as a safety measure for the benefit of light traffic.

(Continued on page 20)

MOTORIST STRANDED IN SNOWSTORM IS AIDED BY STATE HIGHWAY CREW

Carson City, Nevada.
March 1, 1936

Mr. Charles Whitmore,
District Engineer,
Marysville, Cal.

Dear Sir:

I am taking this means of congratulating you on the splendid force of men that the state has employed at the summit, at Norden, in the State Highway garage.

I came through there recently in a severe snow storm and all the travelers, as well as myself, could not help but notice the courtesy shown us all and the splendid management of Mr. Weeks.

Each and every one of the men surely deserve all the credit we can give them. My car broke down almost in front of the garage and it was through the courtesy of the kind mechanic and the young man who ran the snow plow (Mr. Taylor) that I finally managed to get to a garage in Truckee.

Such a fine lot of young fellows are truly an asset to your state.

While I am now in Nevada, I am at Lake Tahoe, California, eight months of the year and am proud that I am a taxpayer in California.

Very sincerely,

W. H. JAMES,
Carson City, Nevada.

FIGHTING SNOW ON DONNER SUMMIT section of U. S. 40 kept all equipment busy day and night throughout February. At top, an auger blower type rotary plow hurling snow high over bank. Center, spud type push plow and truck with slope slice bar attachment widening roadway, and below, an auger blower working at night.

Night Accidents 64 Per Cent of Total

(Continued from page 1)

advisory committee, the most practical remedies.

Analyses of accidents must necessarily be somewhat exhaustive for if otherwise the maximum results will not be obtained. To pass the responsibility for 97 per cent of the accidents to the motorist is of no satisfaction to the administrator and of no help to the motorist.

On the one hand the administrator can not help being beset with doubts as to whether or not he really is right; on the other hand the motorist is put in possession of information which, though probably true, is useless. These twin deficiencies are the main reason for the studies made from time to time by the Division of Highways and which it is planned to conduct more intensively during the current year.

FACTS REVEALED BY STUDY

A study of the accidents occurring on the rural state highway system in 1935 confirms in many respects observations made in 1934 and in addition produces other interesting evidence. In the first place it is to be noted that accidents, like traffic itself, occur with greatest frequency upon a comparatively small percentage of the road mileage.

Of the total accidents on the rural state highway system, 48.15 per cent took place on 1094.5 miles, or 8.68 per cent, of the mileage.

A study of 1046 accidents occurring on 215 miles of rural state highway where accidents are more prevalent, permits a few general observations which, though not necessarily true for all localities, are fairly typical.

On the two days of the week when travel is heaviest, Saturday and Sunday, 42 per cent of the accidents took place.

NIGHT ACCIDENTS PREDOMINATE

The number of night accidents, considering traffic, is disproportionately large. Accidents occurring after dark approximate 64 per cent of the total.

Accidents attributable to some condition in the road were 4.1 per cent of the total, but of this percentage 3.3 per cent were due to cars running into others which had already been in collision and blocked the road.

The physical condition of drivers was noteworthy in 25.2 per cent of the cases. The physical conditions customarily observed were intoxication and asleep at wheel.

Vehicles with mechanical defects were observed in 11.1 per cent of the cases.

The reasons why 25.8 per cent of the accidents involved only single vehicles were not examined, but it is suspected that many were due to the poor physical condition of the drivers or of the cars. However, included in this group there necessarily are many indeterminate instances in which the drivers said other vehicles ran them off the road.

TWO-CAR ACCIDENTS

Two-car accidents are more numerous than single-car accidents and the greater amount of data available in individual cases presents better opportunity for sound logical inference.

In studying two-car accidents the maneuvers in which the vehicles were engaged are classified under four types: overtaking; approaching; paths intersecting because one vehicle is preparing to leave the road on which both were traveling; and paths intersecting in the case of vehicles which have been traveling different roads. These last two cases embrace typical intersection accidents.

The respective ratios of these two groups to the total two-car accidents are 15.8 per cent and 11.1 per cent. With respect to the state as a whole, these two ratios are without particular significance because the number of heavily traveled intersections is localized. However, the differential between the two is notable. It indicates that as much or more attention must be paid to getting vehicles off the highway as onto it.

REAR-END COLLISIONS

The accidents occurring during the overtaking and approaching maneuvers are almost identical in number. The former are 35.5 and the latter 35.7 per cent of the total two-car accidents. The reason for the unsuspected number of rear-end collisions

(Continued on page 12)

SPEED DIFFERENTIAL AN ACCIDENT FACTOR—The above pictures illustrate how slow moving trucks force faster moving autos into the lane of approaching traffic. At top, a scene on U. S. 99 near Banning showing automobiles trying to pass a line of 5 hay trucks from Imperial Valley. In center, autos are held up by a slow truck passing another in Altamont Pass. Bottom picture shows heavy trucking monopolizing the highway in Grapevine Canyon, Kern County.

Three Fatalities Caused by Flood that Closed Highway Near Merced

By **R. E. PIERCE,** District Engineer

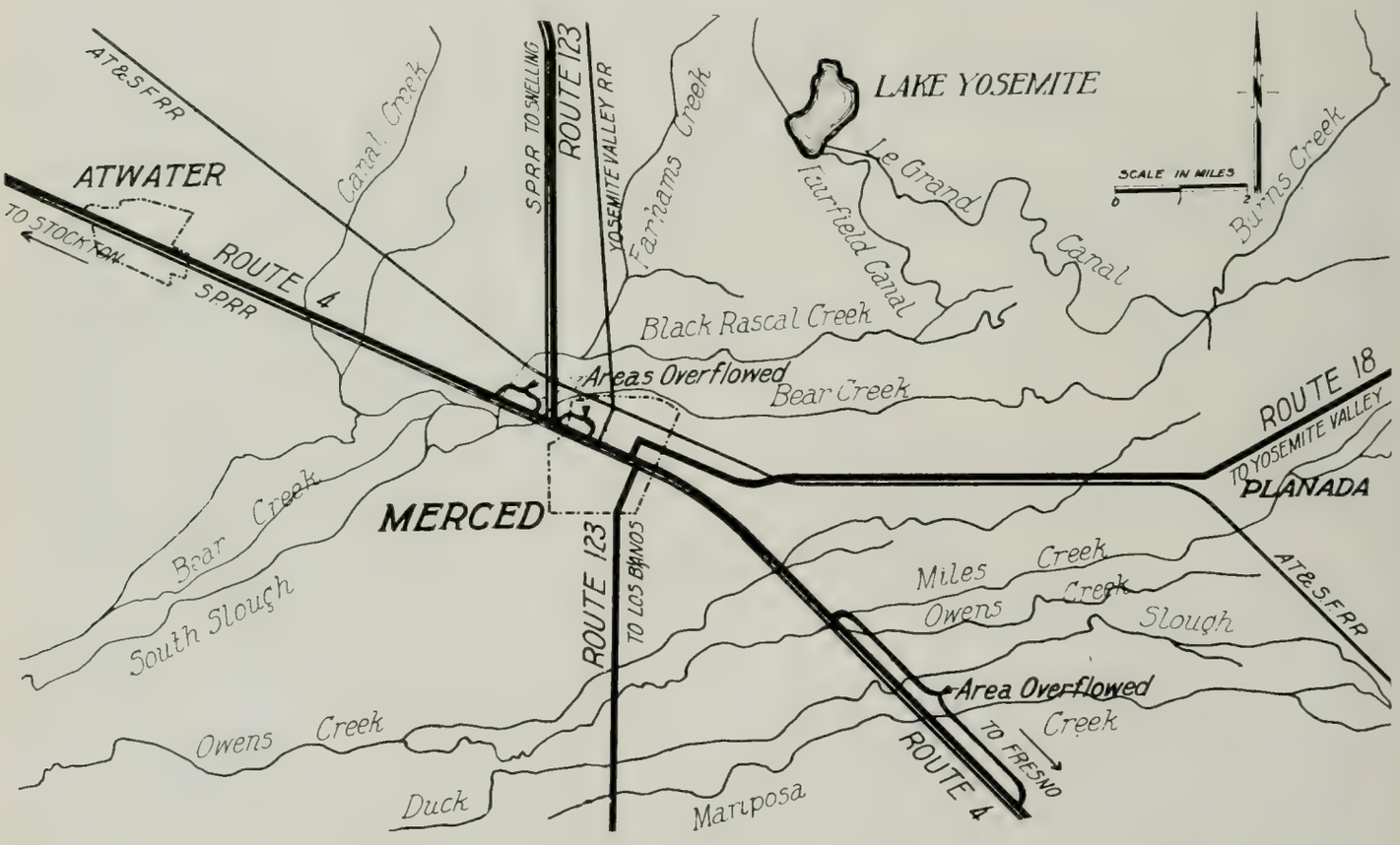
DURING the most severe and protracted storm experienced in the northern part of the San Joaquin Valley for many years, rain fell at Merced on sixteen out of the first twenty-five days of February, with a total precipitation of 6.84 inches. At Mariposa, thirty miles east, for the same period, 19.03 inches fell.

While the rainfall was probably just as great and doubtless greater in other parts of District X, the only main trunk highway in the district over which traffic could not pass during the storm was a portion of U. S. 99, State Route 4, on either side of the city of Merced, and within the city. This condition occurred twice during the storm period, from February 11 to 15 and again from February 22 to 26.

Last year in April heavy rains caused a flood which closed Highway Route 4 to traffic, and flooded Merced to a considerably greater extent than did the recent storm.

This was due to the fact that last April there was no opening through the Southern Pacific Railroad grade across the city and the waters did not subside until the city authorities washed out a channel under an old bridge, which had been filled in by the railroad company.

The recent storm while being more intense did not flood the city so much, partly because this railroad bridge was still open, and also because there was a strenuous effort by the townspeople to raise the levees on Bear Creek, and hold the water out of the city.



In this work the state forces cooperated at the point where our road crosses Bear Creek, placing about 400 sand bags, and while the effort was not entirely successful, the water was held out until the peak of the flood had passed.

LONG DETOUR FOR TRAFFIC

The most serious condition in so far as the highway was concerned, was the flooding of the highway north and south of

(Continued on page 18)

THREE FEET DEEP, on U. S. 99 south of Merced February 14th, and over your head in the ditch.

WAVES ROLLED INSTEAD OF WHEELS on morning of February 15th for 5 miles north of Merced.

NAVIGABLE FOR CARS following white life line on high side with maximum depth of 8 inches.

Late Dr. Elwood Mead Eulogized at Memorial Meeting Held in Redding

A notable group of citizens of northern California, including federal, state, county and municipal officials, gathered under the auspices of the Redding Chamber of Commerce at a testimonial dinner in Redding, February 19, in memory of the late Elwood Mead, former head of the United States Reclamation Service, whose efforts in that capacity greatly aided the Central Valley Water Project now in progress of construction. Memorial addresses were made by Walker R. Young, Chief Engineer for the U. S. Reclamation Service; Earl Lee Kelly, State Director of Public Works and chairman of the Central Valley Water Authority, and State Senators Jack Metzger and J. B. McColl. The principal eulogy of the occasion was delivered by State Engineer Edward Hyatt, who knew Dr. Mead intimately, and an engrossed resolution was presented by Francis Carr, member of the State Water Commission. Mr. Hyatt's eulogy is reproduced in part in the following article.

By **EDWARD HYATT,** State Engineer

ELWOOD MEAD was born in the village of Patriot, Indiana, January 16, 1858. His early life was spent on a farm, under humble conditions. As a boy he was brilliant in school, and in a time when a college education was a rarity his exceptional abilities were recognized. He worked his way through school as a rodman on a survey crew. His nickname was "Woody."

In 1882 he graduated from Purdue University with a bachelor of science degree. The following year he was made master of science, and in 1886 he received the degree of civil engineer.

In one of his rare intimate moments he related to me his pride and joy in securing his first job after graduation, in 1884, as an assistant engineer with the Army on a survey of the Wabash River, which came about as the result of a personal interview with the Governor of the State of Indiana.

It was not long until he was offered the position of professor of mathematics at Colorado Agricultural College. Whether to leave his job and his native state to go into the unknown land of the West was a serious question, but he decided to cast his lot with the growing West.

FIRST IRRIGATION PROFESSOR

After two years as professor of mathematics, Dr. Mead in 1886 became professor of irrigation engineering at the Colorado Agriculture College, the first such chair held in an American school. In addition, he served Colorado as Assistant State Engineer. He went to Wyoming as Territorial Engineer and served as State Engineer from 1888 to 1889. It was during this period that he first gained prominence.

When the new commonwealth was being organized, Dr. Mead, as State Engineer, proposed an entirely new water law for inclusion in the state constitution, one which turned its back upon the common law principle of riparian rights which had thrown into confusion the legal status of water in the arid West.

Under the Mead plan, the state retained title to all water, surface and underground. The success of the fight for this reform made Dr. Mead known throughout the entire West. With the spread of his reputation as an authority on irrigation and water laws, the young engineer was in demand as a speaker before civic and technical associations. His reputation reached the East.

BECAME CALIFORNIA PROFESSOR

Dr. Mead served as chief of the irrigation and drainage section of the Department of Agriculture for eight years ending in 1907, and then served the University of California concurrently as professor of institutions and practice of irrigation. He was detailed as an expert in the celebrated Kansas-Colorado case to aid in the broad policy to be laid down by the courts, and wrote papers on the influence of state boundaries on water right controversies and water rights within the states.

Won Fame at Home and Abroad

(Continued from preceding page)

In 1907 Dr. Mead went to Australia as chairman of the State Rivers and Water Supply Commission of Victoria. He inaugurated a comprehensive water conservation and reclamation plan in Victoria during his eight years of service that is one of the models of the British Empire today.

Australia commissioned Dr. Mead and Hon. Hugh McKenzie, Minister for Lands, to visit Italy, Ireland, Denmark and Germany to observe what those governments were doing to bring about a home-owning population. They journeyed to Great Britain to attract settlers to Australia, in which mission they were successful. Dr. Mead later acted as adviser to the governments of New South Wales, Canada, Hawaii, Java and Mexico.

APPOINTED U. S. RECLAMATION CHIEF

Dr. Mead resigned his position in Victoria in 1913 to accept the new post of professor of rural institutions at the University of California, and chairman of the State Land Settlement Board. In 1917 he acted as consulting engineer on a board in regard to the construction of the All-American Canal to Imperial Valley. In 1923 he was appointed by the Secretary of the Interior as a special adviser on reclamation and on April 3, 1924, President Coolidge appointed him Commissioner of Reclamation. Under his leadership reclamation was placed on a still firmer foundation of usefulness to the nation. Dr. Mead was appointed by the President a special commissioner on the International Water Commission on December 27, 1924.

DR. ELWOOD MEAD

In 1927, Dr. Mead secured a leave of absence as Commissioner of Reclamation and went to Palestine as head of a commission of six members and mapped out a plan for reclaiming Palestine for the Jews.

BUILT BOULDER DAM

From 1924 until the time of his death, Dr. Mead was the acting directing head of the vast construction and operating activities of the United States Bureau of Reclamation. His noteworthy accomplishments during this period included building the greatest dam of all time at Boulder Canyon and some twenty other water storage projects in the West.

Dr. Mead was a member and past director of the American Society of Civil Engineers, a member and past president of the American Society of Engineers, and the British Institute of Civil Engineers.

He was the author of two books used widely as texts, entitled "Helping Men Own Farms" and "Irrigation Institutions." In addition he prepared hundreds of articles, papers, reports and statements dealing with water rights, irrigation, settlement and kindred subjects.

Dr. Mead was a lovable character, and in his death the United States lost one of its most valuable servants.

California, with 5,600,000 population, has more than twice as many automobiles as all of Germany, with 65,000,000 population. Los Angeles County alone has more automobiles than Germany.

Last of the Feather River Canyon Highway Bridges Completed at Tobin

By **E. C. BISSELL,** Resident Engineer

FUTURE motorists traveling over the Feather River Canyon State Highway, may wonder why the road criss-crosses the river and the line of the Western Pacific railway in what to the layman may appear to be an eccentric manner.

To the engineers of the Division of Highways this apparently purposeless meandering of the mountain thoroughfare was one of engineering necessity.

The route of the new highway crosses from one side of the Feather to the other over State-constructed bridges at six points—Oroville, Pulga, Rock Creek, Tobin, Storrie and Howells. The Oroville structure was the first to be completed, followed by those at Howells, Tobin, Rock Creek and Storrie.

At Pulga the highway bridge leap-frogs over the railroad bridge and at Tobin the positions are reversed, the State crossing passing beneath the railway structure.

PRESENTED CONSTRUCTION PROBLEM

Preemption of the easier course through the Feather River Canyon by the Western Pacific, when it was built some thirty years ago, occasioned a construction problem for the surveyors of the Division of Highways when they came to lay out the new road.

The slopes of the canyon are very precipitous and there is scarcely room for a railroad and a highway on the same side of the river. When the State highway engineers made the location for the highway through the canyon there was no choice but to locate the road on the opposite side of the river to the railroad, and where the railway line crossed the stream it was necessary for the engineers to figure out how they could cross the river at the same place to the opposite bank and maintain proper alignment, provide for grade separation and effect an economical and efficient crossing.

Several surveys were made by the State Division of Highways to determine how it could obtain the best crossing for the highway at Tobin just completed. After thorough investigation, it was decided the locate the highway beneath the railroad bridge.

ABUTMENTS RUB ELBOWS

But there was not enough room to construct another bridge abutment on the rock ledge jutting into the river already occupied by the railroad structure. By close figuring, the problem was solved by building the abutment for the highway bridge so as to form around one corner of the railroad abutment.

As the work of leveling off the solid granite rock for the highway bridge abutment was so close to the existing abutment that any mishap would seriously jeopardize the railroad bridge and the safety of trains, it was decided, after conference with Western Pacific engineers, that no chances should be taken with anything so erratic as dynamite for blasting and that it would be necessary to resort to the "plug and feather" method of breaking the rock.

To those who may be unfamiliar with the term and what it implies, it may be explained that "plugs and feathers" were used by our forefathers to break rock before dynamite was invented.

"PLUGS AND FEATHERS"

The procedure is to drill a series of holes about 6 to 8 inches apart and about 2 feet deep into the rock along a line where it is desired to break it. Two tapered shims of iron, flat on one side and rounded on the other, are placed in the hole and an iron wedge inserted between the flat sides of the "feathers." The iron wedges, or "plugs," are then hammered with a large maul until the rock breaks off. It takes a man a day to do what a stick of dynamite could do in a fraction of a second.

The Tobin bridge is a 290-foot through steel "K" truss span on two 35-foot reinforced concrete abutments. The bridge deck is paved with portland cement concrete and is 24 feet wide between curbs.

Construction of the bridge was a National Recovery Project financed by Federal funds. It was designed by and built under the supervision of the Bridge Department of the Division of Highways.

BRIDGES PLAY LEAP FROG—New State Highway crosses Feather River above railroad structure at Pulga.

TURN ABOUT FAIR PLAY—Recently completed highway bridge crosses almost below railroad bridge at Tobin, 14 miles away.

TOBIN BRIDGE, dwarfed in above picture, is larger than railroad structure, being 290 feet long, 24 feet wide.

Most Rear End Crashes With Trucks

(Continued from page 4)

is found in the speed differential between commercial and passenger vehicles. This reason holds even in cases of some three-lane roads where the center lane hazard is popularly supposed to be be conducive to head-on collisions.

It is true, for instance, of three-lane sections in Fresno, Kern and Alameda counties, where there is a considerable volume of heavy trucking. On the three-lane sections examined, rear-end collisions outnumbered head-on collisions by 57 per cent.

Other data also emphasize the significance of the speed differential. While on the sections studied freight vehicles were involved in 33.9 per cent of the approaching accidents, the comparable percentage for overtaking accidents was greater—47.1 per cent.

On the heavily traveled truck route between Bakersfield and the Grapevine, and in Dublin Canyon, freight vehicles were involved respectively in 75 per cent and 73 per cent of all the overtaking accidents.

TAIL LIGHT LAW EFFECTIVE

Quite clearly there were ample grounds for the act of the last legislature that required additional rear lights and red reflectors on trucks and trailers. Even the most casual observer traveling at night can scarcely avoid noticing the improvement.

It is still somewhat early to measure the results of this new legal requirement but a glimpse of its effectiveness may be had by looking at a case previously cited—the road between Bakersfield and the Grapevine.

On this section it is noteworthy that since July, 1935, when additional lights and reflectors were being installed on freight vehicles, until the end of that year there were no further cases of passenger cars running into the rear ends of trucks.

However, regardless of the results of this legislation the question of the speed differential between vehicles requires further examination. It must be determined whether freight vehicles move too slowly or passenger cars too rapidly.

Field studies on prevailing speeds are now in progress at various locations throughout the state. Cursory inspection of the incomplete data shows the average speeds of passenger cars range from 40 to 50 miles an hour either day or night. A wet surface serves to reduce the average no more than five miles an hour, but the reduction is effective chiefly with respect to vehicles which normally travel over 50 miles an hour.

Cars appear to travel more rapidly up grade than down grade. The number of vehicles traveling in excess of 50 miles an hour varies considerably depending upon place and time, and volume of traffic. On good alignment, with traffic able to move freely, it is not uncommon to find approximately 35 per cent of the vehicles exceeding 50 miles an hour. The maximum speed recorded in daylight was 83 miles an hour, and at night 68 miles an hour in the rain and 71 miles an hour on a dry surface.

SUMMARY OF FINDINGS

The findings of these studies are not conclusive as to all accidents. They do not, for example, apply to city streets, where a majority of the accidents occur. They do not necessarily apply to the entire rural highway system, but they are suggestive of what may be expected.

They indicate that the crux of the rural accident problem is found on a comparatively short road mileage; that increasing attention must be paid to the speed differential between trucks and passenger cars; that night driving speeds for passenger cars are probably too high; and that the intoxicated driver should be the subject of unique attention.

SAFETY DEVICES IGNORED

The increasing accident toll on our state highways is a matter of great concern to those in charge of their construction and maintenance. The accidents examined occurred on our heavily traveled highways, many of which embrace every accepted safety device—multiple traffic lanes of 10-foot width, with 8-foot oiled shoulders, improved sight distance on both vertical and horizontal curves. However, such features seemily offer no deterrent to the occurrence of accidents.

Thousands of dollars have been spent in safety devices, in the installation of uniform

(Continued on page 26)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY----------Director
JOHN W. HOWE----------Editor

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ATTRACTIVE ROADSIDES

The bright days of recent weeks have made us realize that after winter comes the spring. This world seems to be an endurance test and to him who sticks in time comes happiness. But more practically speaking a trip any place in California over our fine roads brings much pure joy. A satin smooth ribbon winding through any part of our state is beautiful.

Not only are the wonders in the state delightful but the state has made an effort to landscape our roads attractively. This helps to attract tourist trade, a primary source of income. Besides enhancing the natural beauty of the surrounding scenery, the planting of shrubbery, vines and trees erases construction scars and prevents the erosion of adjacent slopes and steep banks. From a safety standpoint, attractive roads overcome the tedium and help keep motorists interested.

We all enjoy the roads but do not care about paying for them. But about $260,000 will be spent in California this year on highway beautification. Plans now being formed by the landscape department of the State Division of Highways will entail an expenditure of $159,496 federal and state funds. Also about $100,000 will be expended for maintenance of roadside trees, landscaped areas and various other improvements.—*Woodlake Echo.*

The midday whistle had blown when Murphy shouted, "Has anyone seen me vest?"

"Sure, Murphy," said Pat, "and ye've got it on."

"Right and I have," replied Murphy, gazing solemnly at his bosom, "and it's a good thing ye seen it or I'd have gone home without it."—*Humorist* (London).

Highways Lauded as "the Most Impressive Improvement in State"

"California has been doing a magnificent job of improving its highways."

This compliment to the State Division of Highways was voiced by C. G. Milham, former executive secretary of the All-Year Club of Southern California, during a recent visit to Los Angeles after an absence of five years.

In an interview granted the Los Angeles Herald and Express on February 20, Mr. Milham said that the most impressive improvement he had observed upon his return is reflected in the state highways.

Mr. Milham, accompanied by Mrs. Milham, has been motoring over the Southwest and California.

"People now have money to spend traveling," said Mr. Milham, "and they are going places. Increased advertising for California will bring much of this travel to this state."

Mr. Milham now resides in Williamsburg, Va.

MANY CITIES OF SOUTHLAND RECEIVING GAS TAX BENEFITS

Many southland cities are receiving allotments of state gasoline tax funds for street improvements.

Among jobs reported to start soon, it is noted by the Automobile Club of Southern California engineering department, are the following:

Widening and repaving of D Street in San Bernardino between Third Street and Base Line (power and light lines to be placed underground); widening and improvement of Van Buren Street in Riverside from Magnolia Avenue to Hayes Street; surfacing of State, Carrillo, Ortega and Haley streets, and seal coat improvement over Milpas, Anacapa, De la Vina, Cota and San Andreas streets in Santa Barbara; improvement of Florida Avenue from Taylor Street to east city limits in Hemet, reconstructing pavement on North Street at Fifth in Taft; maintenance of Hobson Way, the main street in Blythe; and various street improvements and maintenance works in Perris, Ventura, Bell and Gardena.

A young lady who had never seen a game of baseball attended one with her escort.

"Isn't that pitcher grand?" she said. "He hits their bats no matter how they hold them!"—*Earth Mover.*

Electricity Made Possible Erection of San Francisco-Oakland Bay Bridge

UNDER the watchful and critical eye of thousands of commuters, the San Francisco-Oakland Bay Bridge, with a sureness suggesting an element of fate, daily creeps toward its destination—a long steel serpent throwing itself across a vast body of water.

So rapid has been the progress of this amazing structure, and with such apparent ease have its engineering difficulties seemed to have been surmounted, that not much thought has been given by the layman to one element that has made all this possible.

Without electricity the San Francisco-Oakland Bay Bridge could not have been built.

CABLE FIRST STEP

Earliest plans by Chief Engineer C. H. Purcell included the laying of an electric cable across the floor of San Francisco Bay, from Pier 24 on the San Francisco water front, to Yerba Buena Island and to Oakland along the Key Route Mole.

This cable, four inches in diameter and 25,000 feet in length, was the first actual step taken before any construction was possible.

From this cable flows the life blood of the bridge. It cost the power company $50,000 to install and its connected load is in excess of 12,000 horsepower, which is sufficient to meet the domestic needs of a community of 50,000 or a city a little less than the population of San Jose, and slightly larger than that of Stockton.

OPERATED CAISSON PUMPS

Without the electric power furnished through the cable, the pumps, so necessary to the system of caissons used in laying the foundations of the piers, could not have been as efficiently and cheaply operated; the giant hoists and derricks, which swing tons of steel into place with such ease, would not have been practical.

Welding equipment, concrete mixers, air compressors and other modern pieces of machinery, through the agency of which the Bay Bridge is rising to be one of the wonders of the age, are all fed by the life stream of electric current flowing on the floor of the bay.

NECKLACE OF LIGHTS

To the layman, the myriad of fantastic lights that at night form a brilliant necklace from San Francisco to Yerba Buena Island, is just something to gasp at and admire. To the engineers and to the workmen of the bridge, they are a means of more quickly accomplishing their task. All night long men work under the lights—building, building. It means, too, that more men can be given employment, for it permits a third shift.

But these arching, looping ropes of light are only temporary. Ordinary incandescent lamps following the curving lines of the catwalks, they will be replaced with the newer, more modern sodium lighting illuminating the straight-lined, two-deck roadbeds.

It may therefore be that the arched beauty of the present lighting may vanish, unless rumored discussions that the cables will be lighted for decorative purposes materialize.

Higher Gas Taxes Reduce Consumption

Higher gasoline tax rates imposed in the states of New York, Pennsylvania and Delaware last year had a definitely harmful economic effect, it is revealed in a report received by the Automobile Club of Southern California.

Loss of gasoline and oil business to other states, decreased use of motor vehicles, reduced consumption of motor fuel and lubricants, and an increase in tax evasion have occurred in those states, the report discloses.

Gasoline consumption in Pennsylvania dropped 9.07 per cent as a result of the higher tax; New York lost 6.6 per cent; and Delaware 3.2 per cent.

Teacher: "Does your father pray, Susie?"

Susie: "Yes, teacher. When we sat down to supper last night the first thing he said was, 'Good Lord! We've got beans again.'"

A BRILLIANT NECKLACE OF LIGHTS is suggested by the arching, looping ropes of big incandescent lamps that at night illuminate the San Francisco Bay Bridge catwalks extending from the Golden Gate metropolis to Yerba Buena Island. Beneath them the third shift works all through the hours of darkness.

Banner Year for Construction Work

THIS YEAR promises to be a banner one in the construction industry in southern California in the opinion of Frank Connolly, manager of the Southern California Chapter Associated General Contractors.

He bases his optimism largely upon the extensive 1936 highway building program undertaken by the State Department of Public Works.

During 1935, Connolly points out, southern California enjoyed the unique distinction of having a proportionately larger volume of contracting business than any other section of the country due to reconstruction of schools, public buildings and other structures made necessary by the 1933 earthquake, construction of the Colorado River aqueduct, and the large state highway program in which the regular state expenditures were augmented by emergency relief appropriations.

"The number of highway projects offered for bids during the latter part of 1935," said Connolly, "almost overtaxed the facilities of the industry but in most cases there was satisfactory competition and a large volume of this construction now is under contract. The work of our highway engineers and contractors has been so excellent that it has attracted the attention of everybody using our roads.

"Motorists marvel at the fine broad highways, easy grades and curves and the wonderful bridges which have been constructed by this group. Most of the emergency funds for highways have been obligated, but the ordinary budget still provides for approximately $1,000,000 per month in highway construction for the next 18 months."

Green: "You must be keen on the talkies, old boy, to go twice a week."

Howarth: "It's not that exactly. You see, if I don't go regularly I can't understand what my children are saying."—*Toronto Globe.*

Rebuilding Sector of San Marcos Pass Alternate in Santa Barbara Area

By **LESTER H. GIBSON,** District Engineer

AMONG the several hundred miles of roads taken into the state highway system by act of the 1931 legislature was the San Marcos Pass road in Santa Barbara County. This highway's southern terminus was the Coast Highway at a point about 2½ miles west of Santa Barbara, the northern terminus also being the Coast Highway at Zaca, about 50 miles northerly from Santa Barbara.

The old road, upon leaving Santa Barbara, wound a treacherous path up the steep southerly slope of the Santa Ynez range of mountains until reaching an elevation of 2220 feet at San Marcos Pass; thence descended the northerly slope to the Santa Ynez River and followed the westerly bank of this water course to near Santa Ynez where a more or less indirect course was followed through the communities of Santa Ynez and Los Olivos.

AN ENTRANCING PANORAMA

A portion of the country traversed is one affording much pleasure to the motorist. The ascent from Santa Barbara to the San Marcos Pass unfolds an ever extending panorama of the beautiful foothill region, Santa Barbara, and a broad expanse of the blue Pacific.

The descent of the northern slope is equally interesting, affording a view for many miles of scenic back country.

This old route is some 10 miles shorter than the regular coast route, and because of its many scenic attractions affords a delightful alternate for the motorist. However, traffic has pretty much avoided this road in the past due to the dangerous curves, switchbacks, and steep grades encountered along certain sections.

Shortly after its inclusion in the state highway system in 1931, plans were made for an orderly rebuilding of portions of the road to bring it up to an adequate standard for a secondary route and a number of contracts have since been completed.

January of this year saw the completion of 5.8 miles of new road from Santa Barbara to a point near the San Marcos Pass, this stretch eliminating the former steep and twisting road up the southerly slope of the Santa Ynez range.

NEW CONSTRUCTION UNDER WAY

Work started the first of this year and is now in progress on the reconstruction of 5.6 miles of the existing road from Santa Barbara Avenue to Los Olivos. The old route, 7.6 miles long, takes a course common among old roads through sectionized country, that of following closely to section lines resulting in many right angled turns with their accompanying dangers and inconvenience to modern traffic.

The new route is practically a straight line between termini, only bending slightly to avoid local improvements. The section rebuilt in 1934 lies contiguous southerly and is also along the same direct line.

The present contract, except for its directness of route and consequent saving of 2 miles in distance, is not of spectacular significance from a construction standpoint as the country traversed is open and no particular problems are presented.

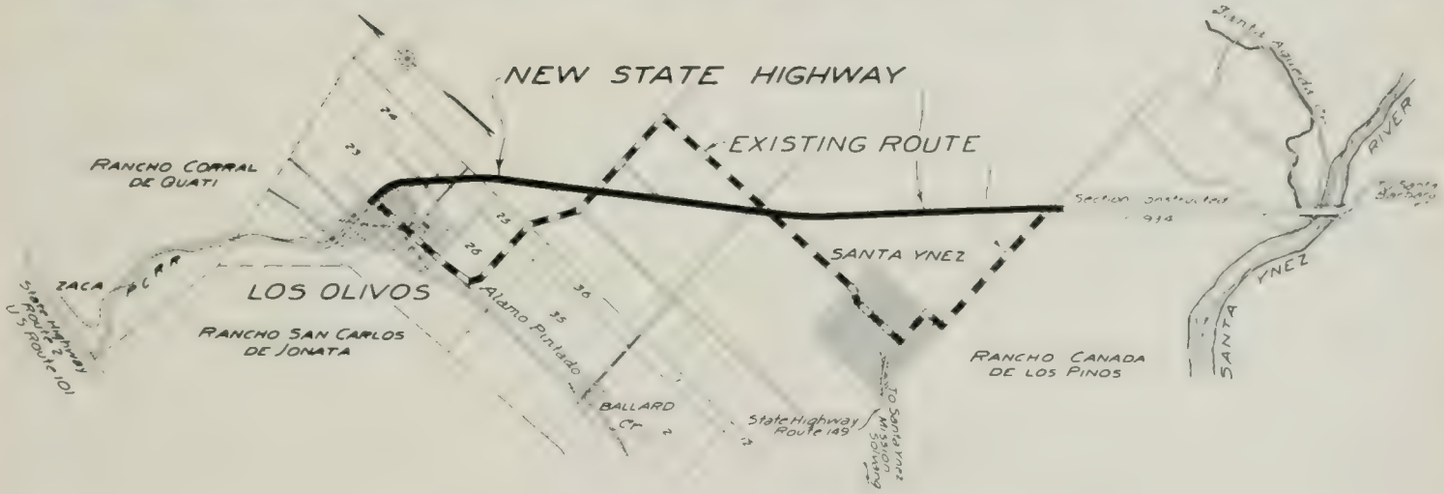
Roadbed width is 24 and 36 feet. On the 24-foot roadbed the fills are being widened one foot to accommodate an intercepting dike to prevent fill slope erosion. Surfacing will consist of a 20 foot by 3 inch screened gravel base, water-bound, topped with a 20 foot by 3 inch road mixed oil and screened gravel pavement. Shoulders are to receive an oil penetration.

PROVIDES ALTERNATE ROUTE

Major structure work embraces a triple 8 by 7 foot box culvert as well as a number of 6 by 7 foot cattle passes.

This project, scheduled to be finished the latter part of June of this year, together with the recently completed grade relocation north of Santa Barbara, will encourage the motorist using the Coast Highway to consider the San Marcos Road as an alternate route through the Santa Barbara area.

The project is being financed from a $141,000 allocation of Federal Works Program highway funds and utilizes labor from local communities. Ted Baun is resident engineer for the state.



DIRECT LINE RECONSTRUCTION is typified in the realignment of 5.6 miles of San Marcos Pass route through Santa Ynez and Los Olivos in Santa Barbara County. The existing route zigzags back and forth, following section lines, resulting in many right angled turns with their accompanying dangers and inconvenience to modern traffic. The new line on which grading operations are under way goes straight across country with a resulting saving of 2 miles to motorists in time and distance.

Citizens Urge Flood Control Project

(Continued from page 6)

Merced, making it necessary to detour traffic many miles out of direction, and also making it necessary for Maintenance Superintendent George Marshall to employ sixty-five additional men to direct traffic and rent three additional light trucks for piloting traffic through stretches of road covered by water.

This flooding is caused by the overflowing of several creeks heading in the Sierra foothills east of Merced and flowing westerly to the San Joaquin River.

The principal streams north of Merced are Bear Creek and Black Rascal Creek; south of Merced are Miles Creek, Owens Creek, Duck Slough, Mariposa Creek and Deadman's Creek.

This overflowing is aggravated by the railroad embankment not having sufficient opening to pass the water rapidly. The State Highway being adjacent to and on the upstream side of the railroad and having a low grade line, is soon covered with water every time these creeks overflow.

FLOOD CONTROL SURVEY MADE

Several years ago an engineering study of this area was made with recommendations for flood control.

The report recommended the construction of several flood control dams, and the combining and enlarging of some of the channels at an estimated cost of about $1,000,000.

Nothing was ever done toward putting the plan into effect as it was considered too big a financial burden on the property involved.

After the recent flood there was a demand from the property owners that something be done, and a local flood committee was formed to contact federal and state authorities having in mind securing financial assistance to put into effect some plan of flood control.

ALTERNATIVE SOLUTIONS

If this is done the problem in so far as the State Division of Highways is concerned would be solved by the expenditure of a comparatively small sum for enlarging a few bridges. However, if nothing is done toward flood control, the only relief for the periodical flooding of the highway would be a raising of the grade for several miles and the enlarging of existing and the building of additional bridges.

The depth of water over the crown of the pavement reached a maximum of thirty-eight inches both north and south of Merced, and in the northerly part of the city the depth was twenty-four inches over the crown of the pavement.

State Highway Route 123 north and south of Merced and Route 18 east of Merced were all covered by water at times but the depth over the pavement did not exceed twelve inches, and traffic was able to get through, in some cases being handled by pilot cars under one way patrol in order to keep cars on the pavement where the force of the water had washed out the shoulders, in some cases to a depth of twelve inches adjacent to the pavement.

THREE FATALITIES RESULT

Three fatalities occurred during the flooded period; one, a flagman temporarily employed for the emergency was struck at night by an auto he was trying to stop.

The other two were a man and wife who were killed when the car they were in crashed into the rear of a truck standing in a line of traffic waiting to be piloted through flood waters, and after they had been signaled to stop by our flagman.

In other parts of District X the high water caused considerable damage, especially in the foothills along the Mother Lode where the rains reached cloudburst proportions. In numerous places water passed over roads where it had never been observed in the past twenty years.

PATROL AIDED WORKERS

Our maintenance superintendents and crews in this district were contiuously on duty for long periods and traffic was cared for as the necessity arose with a minimum of inconvenience.

The California Highway Patrol of both Merced and Mariposa counties gave wonderful cooperation and can not be too highly praised for it. Our superintendent reports that they were out with our men at all hours and their aid was invaluable.

GOOD BOATING CONDITIONS existed on part of State Route 123 near Merced.

LAND BEGAN TO SHOW ON U. S. 99 south of Merced on February 15 as waters receded.

WATER SPORTS began with bicycling and wet feet when the flood had somewhat subsided.

Donner Crews Succor Trapped Autoists

(Continued from page 2)

By afternoon the wind reached such a velocity and visibility was so poor on the summit that all east and westbound traffic was stopped from 2.45 p.m. until 8 p.m. On February 13, eastbound trucks were allowed to proceed in the morning while westbound trucks were released at noon. Poor visibility and bad drifting necessitated the halting of both east and westbound trucks again between 4.30 a.m. and 9.30 a.m. on February 14.

DRIFTS CLOSED ROAD

A ski tournament scheduled to be held at Cisco February 15–16 was cancelled as a result of adverse weather conditions. Although the road was kept open, the move was a wise one as our equipment was extremely busy and no parking space could have been provided for cars at the ski grounds.

On February 16, the intensity of the wind increased and falling snow was much drier than in previous storms. As a result, the snow drifted to such an extent that the traveled way became so narrow as to necessitate closing the highway from 5 a.m. to 11.55 p.m. A rock slide occurred on Route 38 down the river from Truckee on February 21, which blocked the road for four and one-half hours.

Saturday, February 22, was a holiday and as the weather appeared favorable, a large number of winter sports enthusiasts came to this region for participation in and enjoyment of a ski meet at Tahoe City. But a severe storm blew up Saturday night and early Sunday and many of them were snowed in between Tahoe City and the state line and between Tahoe City and Meeks Bay.

TRAFFIC FOLLOWED PILOT

Donner Summit again was closed to all trucks at 9.30 a.m. on the 23d and a rising wind velocity and a number of slides made it necessary to close both safety gates to all traffic at 11.30 a.m. the same day. In order to put traffic over Route 37, a pilot car was then put into use and traffic traveling east was conducted from Baxter's at 7.45 p.m. while westbound cars were allowed to proceed behind the pilot from the Truckee gate at 9.30 p.m.

No heavy trucks were taken care of. The number of cars in the westbound traffic line was approximately 75. Light traffic was conducted by the pilot car until 10.15 p.m., at which time it was permitted to continue without guidance. Heavy trucks were released at both gates at 4.50 a.m. on the 24th.

ROTARY FREED SNOWED-INS

During all this time a rotary plow was kept in the Lake Tahoe region in an effort to free snowbound people. By nightfall of February 24 the plow had reached snowed-in groups as far south along the lake as Tahoma and to Brockway on the north. While the plow was proceeding to Brockway a fall of snow two feet in depth behind the plow made it necessary to return at a slow pace to Tahoe City.

The situation on Donner Summit by this time had reached such a critical point that the rotary plow was recalled to that point.

On February 24, the wind increased in velocity and eastbound trucks were stopped at 3.35 p.m. and westbound trucks at 12.35 p.m. Due to an unusually heavy wind which caused heavy driftage across the summit, the gates were closed to all traffic at 5.45 p.m.

During the nights of February 24 and 25, numerous heavy snow slides came in on the Donner grade, some of which were approximately 200 feet long and 20 feet deep and were composed of very solid snow. These slides stopped traffic that was still in between the gates after the gates had been closed.

CARS TRAPPED BY SLIDES

On the west side of the slides a stage and approximately twenty cars were stopped.

Every effort was made to make these people safe and comfortable. They were given hot coffee and food from the Donner Summit crews' cookhouse and frequent inspection was made of the cars to avoid the occupants' becoming gassed or too cold.

All three rotary plows in the immediate Truckee vicinity were kept working at the slides in an effort to break through as soon as possible. It was not until 9.30 a.m. on the 25th that the stalled traffic was freed and proceeded to Truckee.

Due to the extreme cold, many of the motorists who stayed in their cars while

(Continued on next page)

U. S. ARMY OFFICER PAYS TRIBUTE OF APPRECIATION TO THIS HIGHWAY MAGAZINE

INFORMATION contained in California Highways and Public Works is of real value to army officers attending schools of instruction at Fort Leavenworth, according to a complimentary letter received from Major Arthur Wilson, formerly of the California National Guard and now an instructor of the General Staff School at Fort Leavenworth.

"The California Highways and Public Works is a fine publication to get, especially while one is connected with these army schools," writes Major Wilson. "Every now and then there is something in it of real military value as we do a lot of study on the geography of certain regions from the military viewpoint. Will you please send me a large size map of California, something like the one on the back of the Highway Bulletin which shows the road system and planned roads up to date."

Major Wilson graduated from the Oroville high school and the University of California. He enlisted in the National Guard of this state and in 1916 went with it to the border for service during the Mexican revolutionary troubles which culminated in General Pershing's expedition into Mexico after Villa in 1917. In those days, Major Wilson was in the old 5th Infantry, 2nd California. He went overseas with his outfit as a lieutenant. In France he transferred to the Field Artillery and when the war ended remained in that branch of the army as a captain.

Major Wilson took the two-year course of the General Staff School at Leavenworth, graduating in 1934, completed the Chemical Warfare course and finished the Army War College instruction last June, when he was assigned to Fort Leavenworth as an instructor.

DONNER SUMMIT CLOSED BY SLIDES

(Continued from preceding page)

stalled on the grade over night kept their motors running in an effort to keep warm. Realizing that this procedure would probably exhaust the fuel supply, the highway employees had a local gasoline truck in the immediate vicinity as soon as the slides were removed so that any of the cars lacking in gasoline would not be delayed.

TRAFFIC PATROL NECESSARY

Keeping all the rotary plows in the slide area resulted in the rest of the road becoming quite narrow and it was found advisable to use a pilot car for light traffic until 3 p.m., at which time light traffic was allowed to proceed without the traffic patrol. Trucks were not released until February 26 at 1 p.m.

Upon the clearance of the traffic and widening of the traveled way on Route 37, a rotary plow again was dispatched to the Lake Tahoe section and a second plow cleared the road to Hobart Mills.

A commendable feature of the work in connection with the difficulties encountered on the 25th was that no complaints were received at any time from traffic stalled on Donner Summit grade during the heavy storm.

Automobile Industry Recorded 45% Gain in Output for 1935

AMERICA'S motor vehicle industry forged ahead under the impulse of generally improved business conditions last year to a 45 per cent gain in output over 1934.

An American manufacturers' association report shows foreign sales gained 34 per cent.

The total motor vehicle registration for the year in the United States was approximately 26,000,000, consisting of 22,450,000 motor cars and 3,550,000 trucks. The world registration of motor vehicles was 36,500,000. Thus 71 per cent of the world's motor vehicle population was in the United States.

$2,186,500,000 BUSINESS

The combined wholesale value of both cars and trucks was $2,186,500,000. Parts and accessories for replacements and service equipment represented $565,000,000 additional. The wholesale value of rubber tires for replacement was $248,000,000. The grand total represented by motor vehicles, parts, accessories, service equipment, and tires was $2,999,500,000 wholesale value.

Manufacture and use of automobiles contributed to the activity of many other industries. The figures reveal that the automobile industry last year consumed 89 per cent of the nation's gasoline production; 75 per cent of the rubber; 59 per cent of the lubricants; 77 per cent of the plate glass; 33 per cent of the nickel; 16 per cent of the aluminum; 23 per cent of the iron and steel; 8 per cent of the hardwood lumber; 22 per cent of the copper; and 39 per cent of the lead. Cotton fabric used in tires totaled 210,000,000 pounds.

Sign at Library: Only low talk permitted here. —*American Humorist.*

New Method of Soil Stabilization a Feature of Coast Highway Project

By **J. M. LACKEY,** Assistant District Construction Engineer

PAVING the last link of the Roosevelt Highway along the south coast between Oxnard and Santa Monica was completed in the summer of 1929. Traffic immediately became so heavy that preparations for a widening and realignment program were started at once. Plans generally provided for an 80-foot roadbed and improvement in alignment and grades and necessary drainage corrections.

From Santa Monica north for 7½ miles new pavement was constructed 40 feet to 60 feet in width. The balance for the present is to be 30 feet in width with oiled shoulders.

On July 26, 1935, a contract was awarded for the reconstruction of 5.6 miles between Little Sycamore Canyon and Encinal Canyon. This contract provides for an 80-foot graded roadbed, increasing the pavement width from 20 to 30 feet, oiling shoulders and widening of the Arroyo Sequit Bridge.

GRADING 80-FOOT WIDTH

The roadbed is being graded to an 80-foot width at this time because of right of way agreements and in anticipation of residential subdivision and improvements which would make future widening expensive.

Four years ago a contract was made with the owners of the Malibu Ranch under which a very valuable right of way was donated to the state, one of the terms being that as a part of the original construction the full 80-foot width of right of way would be graded. This was to avoid making any further cut and fill slopes on their land which was being rapidly subdivided and improved. One line change eliminates two 600-foot radius curves.

Interesting features of the job are the stabilization of adobe and clay soils with sand, the redesign of culvert inlets, and the addition of a fourth traffic lane on vertical curves where the sight distance is short.

CLAYS STABILIZED WITH SAND

The existing portland cement concrete pavement is remarkably smooth considering that it was laid nearly seven years ago and that soil conditions are generally very bad. The present excellent condition of the pavement is no doubt due to the fact that it was laid upon a plant-mixed surfacing constructed the year before. This plant-mixed surfacing varied by sections from 2 to 4 inches, the 2-inch courses being supported with a crusher run base of from 2 to 4 inches in thickness.

Under the present widening and alignment plans, beach sand is being blended in to stabilize the clays for a thickness of 12 inches. Blends containing from 25 to 80 per cent of sand are used.

In preparation of the grade for blending, the earth was removed to a sufficient depth to allow for displacement of the sand, then scarified to one foot below subgrade. The calculated amount of sand was then spread and blended with the earth with a machine mixer such as is used for oil mixing.

FIRM SUBBASE PRODUCED

On other jobs where this method of soil stabilization has been used, blending was done by plowing and blading. Best results are obtained when the sand and earth are dry or nearly so. This produces a satisfactory subbase.

Unlike some types of selected materials and decomposed granite, the stabilized soil is dense and does not readily admit moisture to the underlying adobe or clay. There is also a considerable saving in cost as a satisfactory selected material is not to be found within twenty miles of the work.

Not the least of the problems of projects in this locality is drainage. This section of the highway is located along a sloping debris bench from ⅛ to ¼ mile wide bounded by low rugged hills on one side and ending in seacliffs on the other.

LITTLE GRAND CANYON

Storm runoff from nearby hills is quite rapid and carries a large amount of silt and small gravel which in many places is deposited in fans on the bench land and in other places the bench is eroded by great gullies, one of which is called the Little Grand Canyon because of its ruggedness and size but is more

WIDENING THE COAST HIGHWAY between Santa Monica and Oxnard to meet traffic and safety requirements. At top—Grading to 80 foot width through scenic erosion area called the Little Grand Canyon. Below—Providing for addition of a fourth traffic lane on vertical curves where sight distance is short.

like a miniature Bryce Canyon with its fantastically eroded formations.

The difficulty is to so locate the culverts that they will carry the storm water without catching the silt. On new construction where such conditions exist, it is generally considered good practice to locate the culvert in such a manner that the inlet will be well above the flow line so as to provide a settling basin.

Where the culverts are already in place at the bottoms of large fills chimney type inlets are being constructed with openings which are many feet above the flow line grade. The chimney may be heightened as the basin fills up.

SERVES DOUBLE PURPOSE

This serves the double purpose of preventing the silting up of the culverts and filling up unsightly washes, appropriately in line with the soil erosion control work of the Civilian Conservation Corps, much of which is being done in this part of the state.

The frequency of the larger washes has made necessary many grades and sharp vertical curves on the existing road, always a menace to traffic on a 20-foot highway. On the new project four traffic lanes are provided over sharp summits where the sight distance is restricted.

Andy: "Ye wouldna buy your sweetie a ring at the five-and-ten, would ye, Sandy?"

Sandy: "Na, mon, it's better to gang to the twenty-five-cent store and get her a guid one."

Mechanics Prof: "Describe the mechanism of a steam shovel."

Frosh Engineer: "Don't kid me. You can't carry steam on a shovel."

Maintenance Crews Sand 15,000 Miles of Icy Mountain Highways During Winter

By **W. A. SMITH,** Assistant Maintenance Engineer

WINTER, bringing to the Maintenance Department of the Division of Highways problems of snow removal on mountain roads imposes also an additional burden of toil upon the hardy workers of the maintenance crews assigned to the higher altitudes of the State highway system.

Ice prevention and removal, a very important part of the safety program of the Division of Highways, calls for increased labor by the field men of the Maintenance Department throughout the winter season.

Some fifteen hundred miles of highways are given ice protection during the period of cold and stormy weather at an approximate annual cost of $15,000.

SAND MIXED WITH SALT

Special equipment is used for this work and each fall the department prepares for the task ahead by storing at strategic points the material used in sanding stretches of icy road and pavement.

The California Division of Highways, which pioneered in ice prevention work, uses a mixture of sand and salt to combat ice on mountain roads and in sections where heavy frost conditions prevail. Sand is mixed with salt in the proportion of about 100 pounds of salt to each cubic yard of sand and spread over dangerous portions of the highways by a special truck known as a sander.

To a motorist, nothing is more treacherous than a road surface covered with a film of ice. This condition may have been caused by a wet snow that has packed down under traffic until it is too slippery for safety. Or it may have been caused by a plating of sleet that came on unnoticed by the driver who, suddenly and to his utter amazement, finds his car out of control. A dash of rain on a mountain road often will turn a safe pavement into a perilous skidway.

LABOR LONG HOURS

The Maintenance Department does not have special crews for ice prevention work. The snow removal personnel is trained in the use of sanders and takes in its stride the job of locating and sanding frosty and icy sections of pavement.

It is not unusual for these men to labor for twenty-four hours and more at a stretch at their tasks of snow removal and ice prevention.

Early each fall, before the rains set in, the Maintenance Department stockpiles in galvanized iron shelters at convenient locations huge supplies of the sand and salt mixture. The Division of Highways has found this mixture to be the most effective. The salt breaks up the ice on the roadways and permits the sand to form a surface that insures traction for motor vehicles.

STOCKPILED ON HIGHWAYS

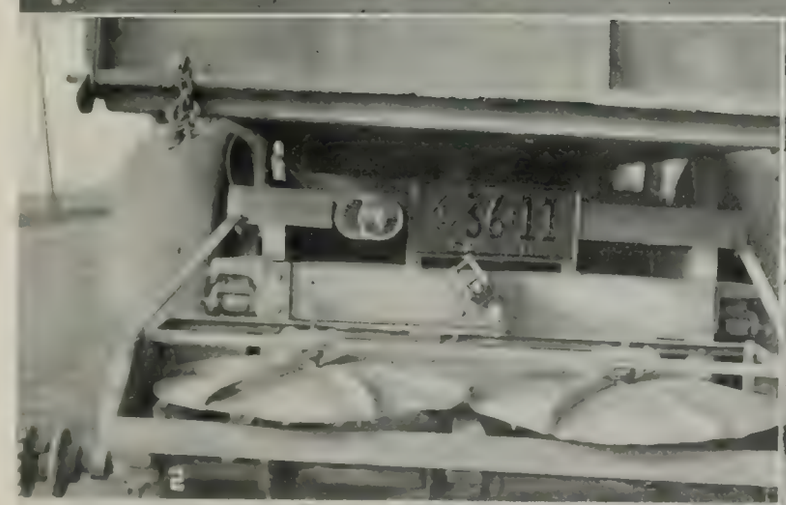
Sanders are stationed at various points for use on the Donner Summit, Trinity, Alturas, Downieville, Red Bluff-Susanville, Redwood Highway and Yosemite All-Year Highway laterals. They are component parts of the snow removal equipment.

Snowdrift control on certain portions of the mountain highway system has been found to reduce the winter work of snow removal and ice prevention.

In many cases during construction it has been possible to raise the grade of the road so that the fill portions will be kept clear of snow by wind action. Likewise the ditch section is widened and the slopes flattened in cuts to provide storage space for snow. In other areas clearing of brush and trimming lower branches of trees will reduce the eddying action of the wind and consequently reduce the deposit of snow at such points.

SNOW FENCE EFFECTIVE

In open areas, snow fence made of lath pickets is installed on the windward side at sufficient distance from the road to insure formation of the drift at the desired point off the road. In some cases planting of trees and shrubbery serves the same purpose. At the present time the State has approximately 90,000 lineal feet of snow fences.



SAFETY FOR ICY PAVEMENTS—No. 1—Stock piles of sand and salt are stored in galvanized shelters at convenient locations. Nos. 2, 3—Disk spreader equipment attached to rear end of truck. No. 4—On the job with distributor actuated by drive-wheel. No. 5—Sand is purchased by the carload.

New Motor Touring Records Predicted for this Year in U. S.

MOTOR TOURING, which set new high records in 1935, is expected to register even further gains during the coming travel season, according to the Touring Bureau of the California State Automobile Association. In a statement discussing the travel outlook this year the motorists' organization said:

"The urge for travel which was reflected in the unprecedented volume of motor vacationing last year can reasonably be expected to receive further stimulus during the coming months from the rapidly widening extent of car ownership and from the broadening of travel horizons through the building of new and improved roads.

MORE AUTOS AND ROADS

"According to preliminary registration figures for the nation there are now about a million more automobiles in use throughout the United States than there were at this time last year. This increase naturally represents a sizeable addition to the stream of annual recreational travel.

"Road building, responding to the impetus of large federal expenditures, has gone forward rapidly and some 30,000 miles of new or improved roads have been added throughout the nation opening up new travel objectives and affording better avenues of approach to existing motor tourist attractions.

"Every indication points to a further improvement over the 1935 travel year, which saw the record total of some 37,000,000 motor tourists taking to the highways and spending an aggregate of about $4,000,000,000 on their journeyings."

AUTOS GIVE 5,065,000 JOBS

Total employment derived from the manufacture, sale, and operation of motor vehicles in the United States amounts to approximately 5,065,000 persons, or about 12 per cent of all those gainfully employed.

In California, the number of persons gaining their livelihood directly from motor vehicle activities is reported as approximately 313,600.

"I read in a book that Apollo was chasing a nymph and she turned into a tree."

"He was lucky. The one I'm chasing always turns into a jewelry shop or restaurant."

EVERY 4 MEN EMPLOYED AT WORK ON HIGHWAYS MAKE JOBS FOR 7 MORE WORKERS

"Present consumption of roundly 18 billions of gallons of gasoline annually," says Director B. H. Markham of the American Petroleum Industries Committee, "will produce more than $500,000,000 yearly revenue from a three-cent gasoline tax. Since every dollar expended upon highways starts a trade movement which results in the ultimate distribution of $3.15 in business activity and in wages, $500,000,000 spent upon roads would distribute $1,575,000,000 in trade and wages among 24 industries.

Every four men put to work on highways make jobs for seven additional workers in industries whose products are used in highway construction, improvement, and maintenance. Certainly this method of creating employment and distributing wages is preferable to spending endlessly and indiscriminately from gasoline tax funds for other state expenses, especially since it gives those who pay this special additional tax for roads the roads for which they are paying. No other method will accomplish that!"

ACCIDENT PREVENTION STUDY

(Continued from page 12)

warning and directional signs, the separation of traffic at grade crossings, the installation of sight posts on curves, sanding of icy pavement, snow removal; all are of little avail.

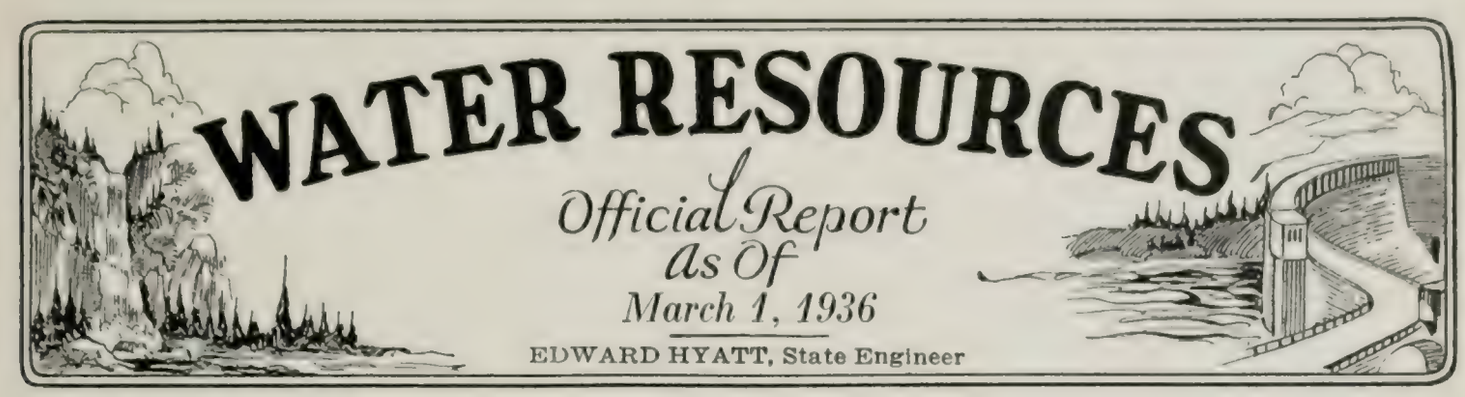
All records point to the fact that in the majority of cases it is not the use but the abuse of the present road facilities which is responsible for accidents.

ALL AGE GROUPS INVOLVED

Considered by age groups, the number of drivers involved in accidents is nearly proportional to the number of registered drivers in each of the age groups. In other words, all classes of drivers, not necessarily the young alone, are laboring under much the same physical and mental handicaps.

The speeders and the drunken drivers, who approximate one-fourth of the offenders, can very properly be taken care of by strict enforcement. The remainder, who we might say comprise the general run of drivers, are admittedly ignorant either of driving conditions, the mechanical operation of their cars, or knowledge of the rules of the road, and must be educated as to these fundamentals.

He: "May I take you home?"
She: "Sure, where do you live?"



The early storms of February increased the flow of the Sacramento River at Sacramento from 75,000 second-feet to about 82,000 second-feet on February 17th plus the additional flow in Yolo By-pass, resulting in a continued recession of salinity so that at present Suisun Bay is practically fresh.

Snow surveys on western Sierra slopes indicated, in general, a snow cover and water content less than that of February 1, 1935. Precipitation data in the north indicated that seasonal totals to February 1st were about 95 per cent of normal.

Applications for repairs and alterations of dams, news of the irrigation districts and other activities of the department are given in report of the State Engineer which follows:

IRRIGATION DISTRICTS

Investigation was made in the field of work proposed by the Fairoaks Irrigation District, for which the directors had requested approval by the Districts Securities Commission. This work consists of the removal of a part of the old main pipe line, installed in 1906 near the eastern boundary of the district, and replacement with 1400 feet of 30-inch welded steel pipe.

A new bulletin containing the revised irrigation district laws, copy for which was compiled and edited by the Division of Water Resources, has just been printed by the Supervisor of Documents, Bureau of State Printing, who will handle distribution under the provisions of Chapter 82, Statutes of 1933.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

Routine maintenance was carried on during this period with a small crew. The cracks and washes in the new levee from Butte Creek to Colusa on the east side of the Sacramento River, and the training levees of the Moulton and Colusa weirs, were filled and tamped.

The three drainage pumping plants east of the Sutter By-pass were operated almost continuously during this period. Several washes in the levees of the Sacramento By-pass were filled.

Relief Labor Work

Approximately 200 relief workers were engaged on projects under the supervision of this office during the period. However, work in the river bottoms was interrupted for a number of days on account of high water, and the men were worked on near-by levees removing brush and trees. This work was all done in Sutter and Yuba counties on the Sutter-Butte By-pass, Feather River and Bear River.

Sacramento Flood Control Project

Work has been continued on preparing the right of way on the south bank of the American River near Perkins, the work during this period consisting mostly of removing hop poles and constructing new anchorages. Several pipes for irrigation were installed.

Several reports were made upon applications before the Reclamation Board, and a number of inspections were made of construction authorized under applications previously approved.

DAMS

Application for the construction of a dam was filed by the Pioneer Dredging Company on February 11, 1936. The dam is to be located on a small drainage in Shasta County approximately six miles north of Redding. The dam will be an earthfill 40 feet in height storing approximately 350 acre-feet of water and is to cost approximately $3,000.

Application for alteration of the Hughes Dam in Placer County was filed January 27, 1936, by the California Lands, Inc. This is a small structure storing approximately 80 acre-feet which was to be altered to decrease the storage capacity and height to remove it from state jurisdiction. The application was approved February 7, 1936, and the work of alteration has been completed.

Application was filed on January 29, 1936, for repairs to the Modesto dam of the city of Modesto. The work proposed consists of replacing sections of the timber sheet piling cut-off with steel sheet piling. This application was approved February 10, 1936.

Application for the enlargement of the Sheffield dam of the city of Santa Barbara was approved January 29, 1936.

Application for the repair of the Pine Grove dam in Nevada County was approved January 27, 1936.

Applications were filed for the approval of Grub Flat and Morgan earthfill dams in Butte County which had not previously been filed. The owner of these dams is the Cherokee Drift Mining Company. The Grub Flat dam has a height of approximately 19 feet from streambed to spillway crest and a capacity of 216 acre-feet. The Morgan dam has a height of 19½ feet and a capacity of 130 acre-feet.

(Continued on page 28)

Snow Surveys Reveal Some Deficiency

(Continued from page 27)

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Office work during the past month has been in compilation of the 1935 report covering the diversions, stream flow and return flow in the Sacramento-San Joaquin territory and salinity in the delta.

Field work has comprised only maintenance of the delta tide gages and salinity sampling at permanent stations in the delta.

Subsequent to a flow of approximately 75,000 second-feet in the Sacramento River at Sacramento, resulting from the storms in the middle of January, the flow gradually receded to about 15,000 second-feet on February 10th. Since the latter date the recent storm again brought the flow on February 17th to about 82,000 second-feet, plus the additional flow in Yolo By-pass.

The sustained river flow has resulted in a continued recession of the salinity so that at present Suisun Bay is practically fresh.

CALIFORNIA COOPERATIVE SNOW SURVEYS

In the latter part of January and early February, the first snow surveys of the season were made at key courses throughout the major drainage basins and the results of these surveys, together with available precipitation data from all stations in the foothill and mountain areas, were published in the first monthly bulletin of snow survey and precipitation data.

Pending compilation of snow course "normals" to be completed in time for the April 1st bulletin, the results of the recent surveys were compared to the snow cover as shown by the corresponding snow surveys last year. In general the surveys of the western Sierra slope indicated a snow cover and water content less than that of February 1st a year ago; from upper Sacramento River basin to Mokelumne River basin about 90 per cent of last year and south of Mokelumne River basin from 60 per cent to 80 per cent of last year.

The data from the precipitation stations indicated some deficiency on February 1st in almost all basins of the western slope of the Sierra, only slight, however, in the north where seasonal totals to February 1st were about 95 per cent of normal but very marked in the south where in the San Gabriel and Los Angeles basins the seasonal total to February 1st was only about 25 per cent of normal.

WATER RIGHTS

Supervision of Appropriations of Water

Nineteen applications to appropriate water were received in January; 25 were denied and 16 were approved. Nine permits were revoked and three licenses were issued.

Imperial Irrigation District filed an application for 8000 second-feet from Colorado River for the development of power on the All-American Canal.

During the past month a great deal of work has been done in the Los Angeles office in connection with decision on the hearing on the applications of Fallbrook Irrigation District, city of Oceanside and Carlsbad Mutual Water Company for permits to divert water from San Luis Rey River. The physical and legal situation on this river is extremely involved and decision has not as yet been made.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Topographic mapping proceeded in January on Kreyenhagen Hills Quadrangle in Fresno County and the San Bernardino No. 1 and San Bernardino No. 2 Quadrangles in San Bernardino County. Some work was done also in the field in connection with the cultural revision of Hesperia, San Antonio, San Bernardino and Cucamonga Quadrangles in San Bernardino County along the San Andreas Fault. Office work was carried on in connection with the Paynes Creek Quadrangle in Tehama County, the Burney Quadrangle in Shasta County, the Sebastopol Quadrangle in Sonoma County, and the Cucamonga No. 4 Quadrangle in San Bernardino County.

WATER RESOURCES

South Coastal Basin Investigation

Work on the South Coastal Basin investigation proceeded along routine lines during the month.

Central Valley Project

The United States Bureau of Reclamation is proceeding with plans for construction of the project. Both the Denver and local offices of the bureau are exerting every effort to get construction started on the Kennett dam; the necessary relocation of the Southern Pacific Railroad to replace several miles of the present line which will be flooded by the reservoir created; the Contra Costa conduit; the Friant dam, and portions of the Madera and Friant-Kern canals.

The State Division of Highways has started drilling operations at the proposed site of the combination highway-railroad bridge on the Pit River and the State Department of Public Works is cooperating in every possible way with the Bureau of Reclamation in speeding work on the project.

As the doorman ran down to open the limousine door, he tripped and rolled down the last four steps.

"For heaven's sake, be careful," cried the club manager. "They'll think you're a member."

Boss: "There are two dollars missing from this drawer and only you and I have a key to it."

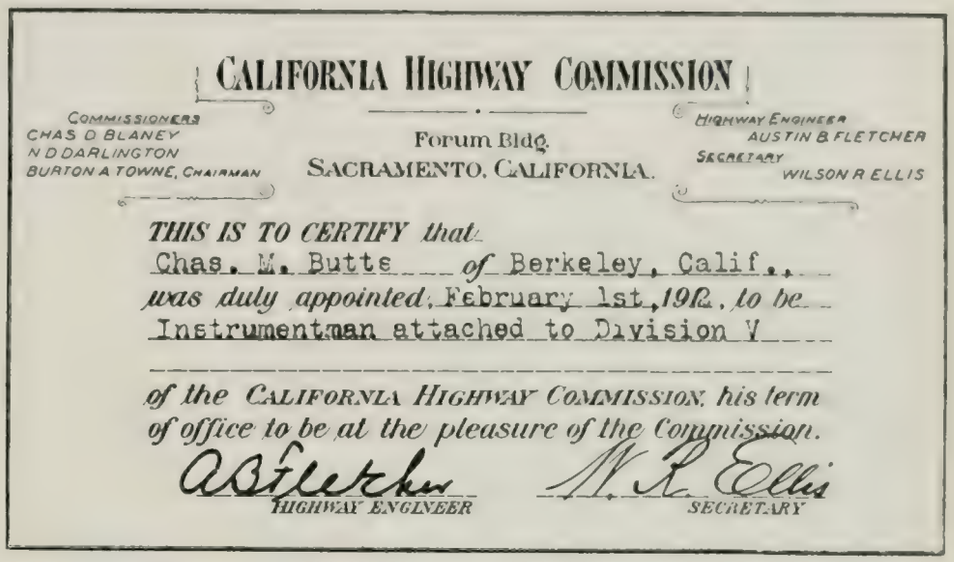
Office Boy: "Well, let's each put a dollar back and forget it."

Old Timer, Do You Hold a Card to Beat This?

A TIE has developed in the friendly contest for the honor of being head man of the Old Timers' Club of the State Division of Highways.

Credit for this development goes to C. M. Butts of Stockton, District Construction Engineer of District X.

In applying for membership in the club, Mr. Butts sent along the identification card given him by the old Highway Commission dated February 1, 1912, the day on which he went to work as an instrumentman attached to Division V.



CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
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N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
Chas. M. Butts of Berkeley, Calif.,
was duly appointed, February 1st, 1912, to be
Instrumentman attached to Division V
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A B Fletcher
HIGHWAY ENGINEER

W. R. Ellis
SECRETARY

TIES THE CONTEST—The card of District Construction Engineer C. M. Butts bears the same date as that of George Mattis shown last month.

His credentials gave him a tie with George Mattis of Emeryville, one of the resident engineers of the San Francisco-Oakland Bay Bridge, in the matter of years elapsed since his original appointment.

So, until an older veteran comes along, the Old Timers' Club will have two head men.

Mr. Butts is a native of Marquette, Michigan, but came west to accept employment with

(Continued on page 30)

IN THE FIELD IN 1913—This picture of an Old Timers locating party was supplied by C. M. Butts, whose photograph appears in the inset. The scene is at San Miguel in San Luis Obispo County and the party was engaged on a preliminary survey of the Coast Highway in that vicinity. Lunching beside their Davenport wagon outfit are: (left to right) Chester Cain, axeman: Charles M. Butts, instrumentman; Harold Fisher, chainman; Warren Burch, chief of party, and the teamster, whose name Butts does not recall.

Old Timer Jumped From Railroad to State Highway Job

(Continued from page 29)

the Western Pacific Railroad. In 1912 he was working as instrumentman for the Western Pacific in Nevada.

"At this time," writes Mr. Butts, "T. J. Wyche, Chief Engineer of the Western Pacific, told me he wanted me to go to Portola to help survey the townsite. I remarked that I had heard the California Highway Commission then being organized, planned extensive road construction work and that I would like to obtain employment with the state as an instrumentman.

"He advised me to get in touch with the late W. S. Caruthers, then division engineer of old Division V, San Luis Obispo. I had known Mr. Caruthers as a locating engineer for the Western Pacific and wrote to him.

"I received a letter from him on January 15, 1912, in which he said he had recommended me to the commission and on January 23 I was notified by the commission of my appointment as instrumentman and instructed to report to Mr. Caruthers for duty on February 1.

REPORTED AT SAN LUIS OBISPO

"I reported to Mr. Caruthers at San Luis Obispo on that date and found he had a survey party assembled and was planning for its disposition. The Highway Commission allowed expenses for an employee for only ten days in any one town. The party remained in San Luis Obispo for ten days and then went to Salinas, where we remained seven days. Then we were directed to move to San Juan for location work on the San Juan grade on the state highway system.

"On January 25, 1914, I was transferred to Division III as a draftsman and served until June, 1914, when I was named resident engineer in charge of concrete road construction between Yuba City and Live Oak in Sutter County. I remained as resident engineer, on various highway construction projects until four years ago, when I was appointed district construction engineer of District X, with headquarters in Sacramento, since moved to Stockton.

TWENTY-FOUR YEARS SERVICE

"On February 1, last, I had enjoyed twenty-four years continuous service with the Division of Highways, with the exception of a period of seven months with the Montana Highway Commission on construction work between Butte and Anaconda, Montana."

With his identification card, Mr. Butts sent in some interesting old photographs showing the locating party of which he was instrumentman in the field at San Juan Bautista, San Miguel, Paso Robles, King City and Templeton back in 1912 and 1913.

In those days his party traveled in a spring wagon, which carried not only members of the crew, but their equipment and grub as well, and this ancient vehicle, drawn by a span of hefty horses, figures prominently in the photos and provides quite a contrast when compared with the modern trucks, automobiles and construction equipment of the Division of Highways today.

Caissons Afloat

UNLOVELY rectangles of wood and steel,
Swarming with men and lit by lurid lights—
But those of us who "mothered" them still feel
They ranked among the world's most thrilling sights.
No "bouncing infant" ever bounced as they,
Or called for such exquisite, precise care,
When winter storms brought white-caps to the bay
And "gaffers" barked: "Take off two pounds of air!"
Which calmed their turbulent tossings for a while,
And let the engineers draw a full breath!
Yes, viewed in retrospect, it brings a smile,
But, then, disaster loomed as clear as death.
Concrete for half a city fed their maws
As they grew downward toward the ocean floor;
Ten feet above the mud we gave them pause
Until "high slack," then SIs swore,
Turned angles swiftly, signaled: "To the right!"
We hauled the anchors tighter on that side,
And released air, that our huge "infant" might
Sink into mud on the receding tide!

Peter W. Mourer, Jr.,
Junior Construction Engineer,
San Francisco-Oakland Bay Bridge

"Mother," said a little boy after coming from a walk, "I've seen a man who makes horses."

"Are you sure?" asked the mother.

"Yes," he replied. "He had a horse nearly finished when I saw him; he was just nailing on his back feet."

Highway Bids and Awards

for February, 1936

ALAMEDA, CONTRA COSTA and SANTA CLARA COUNTIES—Apply Deisel Oil to roadside vegetation over a distance of about 111.4 roadside miles. Dist. IV, various routes and locations. Oilfields Trucking Co., Bakersfield, $4,725; Hayward Bldg. Mtls. Co., Hayward, $3,375. Contract awarded to Pacific Truck Service, San Jose, $2,835.

AMADOR, CALAVERAS, TUOLUMNE and STANISLAUS COUNTIES—Diesel oil to be applied to roadside vegetation for a distance of about 185.1 roadside miles. Dist. X, various routes and sections. Oilfields Trucking Co., Bakersfield, $3,660. Contract awarded to Sheldon Oil Co., Suisun, $3,037.80.

INYO COUNTY—Road-mix Surface Treatment for 7.3 mi. between Death Valley Jct. & Easterly Bndry. Dist. IX, Route 128, Section A. Swuare Oil Co., Los Angeles, $14,840; Basich Bros., Torrance, $11,302; U. B. Lee, San Leandro, $9,620; Oilfield Trucking Co., Bakersfield, $10,574; P. R. Hughes, Long Beach, $10,008; A. S. Vinnall Co., Los Angeles, $12,287; J. C. Compton Co., McMinnville, Ore., $9,237. Contract awarded to C. W. Wood, Stockton, $8,435.

INYO COUNTY—Between Big Pine and Keough Hot Springs, about 7.3 mi. to be graded and surfaced with road-mix surfacing. Dist. IX, Route 23, Section C,D. Union Paving Co., San Francisco, $131,410; V. R. Dennis Const. Co., San Diego, $113,251; Fredricksen & Westbrook, Lower Lake, $120,037; M. J. B. Const. Co., Stockton, $132,575; Young & Son, Ltd., Berkeley, $130,511; Gibbons & Reed Co., Burbank, $119,429; C. W. Caletti & Co., San Rafael, $146,280; Hemstreet & Bell, Marysville, $143,513; Mundo Eng. Co., & Sander Pearson, Los Angeles, $129,261; R. R. Carlson, Stockton, $139,028; Isbell Const. Co., Reno, Nev., $134,774; Oswald Bros., Los Angeles, $118,332. Contract awarded to Basich Bros., Torrance, $109,721.70.

LOS ANGELES COUNTY—Sepulveda Blvd., between San Fernando Road & Brand Blvd., about 3.7 mi. to be graded. Dist. VII, Route 158, Section L.A. Oswald Bros., Los Angeles, $476,807; J. E. Haddock, Ltd., Pasadena, $471,956; P. J. Akmadzich, Los Angeles, $485,486; Gibbons & Reed Co., Burbank, $482,881; Guy F. Atkinson Co., San Francisco, $490,862; Granfield, Farrar & Carlin, San Francisco, $603,813; Sander Pearson & Mundo Eng. Co., Los Angeles, $481,459. Contract awarded to Griffith Co., Los Angeles, $464,533.

LOS ANGELES COUNTY—Through Sunland between Fenwick Street and Scoville Ave., about 0.6 mile to be graded and paved with asphalt concrete. Dist. VII, Route 9, Section L.A. P. J. Akmadzich, Los Angeles, $35,930; Geo. R. Curtis Paving Co., Los Angeles, $37,518; Oswald Bros., Los Angeles, $40,851; Basich Bros., Torrance, $39,477. Contract awarded to Southwest Paving Co., Roscoe, $35,811.75.

LOS ANGELES COUNTY—Between Traffic Circle & Los Angeles St., about 3.7 mi. to be widened and paved with asphalt concrete. Dist. VII, Route 168, Sec. A. Griffith Co., Los Angeles, $49,171; C. O. Sparks, Los Angeles, $47,363; Geo. R. Curtis Pav. Co., Los Angeles, $46,227; Basich Bros., Torrance, $48,353; Oswald Bros., Los Angeles, $41,304. Contract awarded to Sully-Miller Contr. Co., Long Beach, $38,567.75.

MENDOCINO COUNTY—Between Longvale and Dos Rios, about 14.5 miles to be graded. Dist. I, Route 1, Longvale-Dos Rios Feeder. Union Paving Co., San Francisco, $345,762; Granfield, Farrar & Carlin, San Francisco, $347,420; George Pollock Co., Sacramento, $354,985. Contract awarded to Hemstreet & Bell, Marysville, $341,232.50.

MONTEREY COUNTY—Between Bradley & 6 mi. So. of San Ardo, about 6.8 mi. to be graded and paved with P. C. C. and a Reinf. Conc. Bridge to be constructed. Dist. V, Route 2, Section H & I. V. R. Dennis Construction Co., San Diego, $375,900; Wood and Bevanda, Stockton, $346,774; Oswald Bros., Los Angeles, $365,673; Heafey-Moore Co., Oakland, $358,862; A. Teichert & Son, Inc., Sacramento, $354,791; Union Paving Co., San Francisco, $348,879; N. M. Ball Sons & Bodenhamer Const. Co., Oakland, $348,998; David H. Ryan, San Diego, $327,008; Mittry Bros. Const. Co., Los Angeles, $390,815; J. E. Haddock, Ltd., Pasadena, $387,815; Hanrahan Company, San Francisco, $393,710. Contract awarded to Peninsula Paving Co., San Francisco, $316,342.70.

SACRAMENTO COUNTY—Between Isleton & Walnut Grove, about 0.6 mi. riprap slope protection to be constructed. Dist. X, Route 53, Section B, 1st. Healy-Tibbitts Construction Co., San Francisco, $21,665; Hutchinson Co., Oakland, $21,740. Contract awarded to Blake Brothers Company, San Francisco, $20,862.37.

SAN BENITO, MONTEREY, SAN LUIS OBISPO and SANTA BARBARA COUNTIES—In Dist. V at various locations. Diesel oil to be applied to roadside vegetation for a distance of about 200 Rdsd. miles. Routes 2, 10, 33, 56, 57, 58, 80, 119, 149, various sections. L. A. Brisco, Arroyo Grande, $7,843; Consumer's Oil Co., Los Angeles, $7,875; Walter Roselip, San Luis Obispo, $7,969; Oilfields Trucking Co., Bakersfield, $8,190. Contract awarded to Bradley Truck Co., Santa Maria, $6,678.

SAN DIEGO COUNTY—On Palomar Mt. Road, between Iron Spring Cr. and the Observatory Site about 3.3 miles to be graded. Dist. XI, Palomar Mt. Feeder Rd. Daley Corporation, San Diego, $313,133; Granfield, Farrar & Carlin, San Francisco, $342,848; V. R. Dennis Constr. Co., San Diego, $363,555; C. W. Caletti & Co., San Rafael, $298,233; J. E. Haddock, Ltd., Pasadena, $323,601; Oswald Bros., Los Angeles, $325,745; Shafner & Gordon, Los Angeles, $316,116. Contract awarded to Basich Bros., Torrance, $297,396.70.

SAN JOAQUIN COUNTY—Potato Slough at Terminous about ¼ mile to be graded and surf. with road mix surf. & bridge const. Dist. X, Route 53, Sec. C. M. B. McGowan and C. W. Caletti & Co., San Francisco, $197,935; Lord & Bishop, Sacramento, $176,932; E. T. Lesure, Oakland, $176,446; George G. Pollack Company, Sacramento, $210,240. Contract awarded to Bodenhamer Construction Co., Oakland, $171,869.25.

SAN JOAQUIN, STANISLAUS, CALAVERAS, AMADOR, TUOLUMNE and MARIPOSA COUNTIES—Apply Diesel oil to roadside vegetation over 156.7 roadside miles. Dist. X, various routes and sections. Geo. French, Jr., Stockton, $2,911; Oilfields Trucking Co., Bakersfield, $3,564. Contract awarded to Sheldon Oil Co., Suisun, $2,811.20.

SANTA BARBARA COUNTY—Between Tajiguas Cr. & Arroyo Hondo, about 3.1 mi. to be graded and paved with P. C. C. Dist. V, Route 2, Section F. Sander Pearson and Mundo Engineering Co., Los Angeles, $218,697; J. E. Haddock, Ltd., Pasadena, $208,839; Oswald Bros., Los Angeles, $214,735; George R. Curtis Pvg. Co., Los Angeles, $211,271. Contract awarded to Granfield, Farrar & Carlin, San Francisco, $202,819.

SANTA BARBARA and SAN LUIS OBISPO COUNTIES—Between Richfield Tower and Santa Maria River. About 2.4 mi. to be graded and paved with Asph. Conc. Dist. V, Route 2, Section A & F. Oswald Bros., Los Angeles, $67,090; J. A. Casson, Hayward, $72,089; Basich Brothers, Torrance, $69,583. Contract awarded to Heafey-Moore Co., Oakland, $66,562.30.

SANTA CRUZ COUNTY—Between Scotts Valley & 1 mi. N. of Santa Cruz, about 3.9 mi. in length to be graded and surfaced with crusher run base & natural rock asphalt surfacing or crusher run base & plant-mixed surfacing. Dist. IV, Route 5, Section A. R. R. Carlton, Stockton, Alt. "A" $206,056, Alt. "B" $206,433; David H. Ryan, San Diego, Alt "A" $203,470; Young & Son Co., Ltd., Berkeley, Alt. "A" $204,451, Alt. "B" $207,450; Poulos & McEwen, Sacramento, Alt. "A" $205,997; Union Paving Co., San Francisco, Alt. "B" $219,479; Mittry Bros. Const Co., Los Angeles, Alt. "A" $218,083, Alt. "B" $220,712; A. J. Raisch, San Jose, Alt. "A" $224,201, Alt. "B" $224,027; Gibbons & Reed Co., Burbank, Alt. "A" $234,314, Alt. "B" $238,763; A. Teichert & Son, Inc., Sacramento, Alt. "A" $240,926, Alt. "B" $235,803; Hanrahan Co., San Francisco, Alt. "A" $252,053; Wood & Bevanda, Stockton, Alt. "A" $268,371, Alt. "B" $294,879; V. R. Dennis Construction Co., San Diego, $282,272, Alt. "B" $280,730. Contract awarded

(Continued on page 32)

State and Counties Share $5,835,836 Motor Vehicle Fees

MOTORISTS of California contributed $2,917,918.31 in 1935 to develop county roads and a like amount to build and maintain state highways from last year's motor vehicle registration fees.

The 65 per cent of vehicle registration levies allotted equally in 1935 to state and county highway development amounting to $5,835,836.62, exceeds by $391,638.38 the amount apportioned in 1934 when 2,080,884 vehicles were registered in comparison with the record of 2,254,828 registrations in the last year.

County treasuries received $2,782,793.17 in the August settlement and the remaining $135,125.14 of the 1935 apportionment from motor vehicle funds now is being paid. The state highway system receives similar amounts, explains Ray Ingels, Director of Motor Vehicles.

Los Angeles County, with 916,842 registrations, receives a total of $1,186,463.03 as its share of the 1935 apportionment. Alameda County, with 158,225 registrations, is second with an allotment of $204,755.14; San Francisco County, with 157,960 vehicles, is third with $204,412.21, and San Diego County, with 88,872 registrations, was fourth with an apportionment of $115,007.10.

2,254,828 CALIFORNIA MOTOR VEHICLES IN 1935

Shattering all records, California rolled forward to prosperity on rubber tires in 1935 to list 2,254,828 motor vehicles as having paid registration fees in comparison with 2,080,884 in the 12-month period of 1934.

In addition to showing a gain of 173,944 fee-paid registrations of vehicles in the last year, the 1935 total smashed the previous high mark of 1931, when 2,107,275 car owners paid for number plates, representing an increase of 8.36 per cent in fee-paid registrations over the 1934 figure.

Automobiles made up the bulk of registration, totaling 2,015,018 in comparison with 1,876,192 in 1934.

Teacher: "Write a sentence with the word 'analysis' in it."

Pupil's Exam Paper: "The teacher told us to look up the word 'analysis' in the dictionary."—*Chelsea* (Mass.) *Record.*

In Memoriam

ALBERT NELSON BURCH, irrigation engineer and the oldest employee of the Division of Water Resources, passed away at his home, February 21st, at the age of 71 years and 8 months, following an attack of pneumonia.

He was born at Fayette, Iowa, on June 21, 1864, and received his education in the public schools and normal school of that state, later taking a special course in civil engineering at the University of Wisconsin.

In the late nineties Mr. Burch came to California and entered the field of irrigation engineering, his first position of importance being that of superintendent of the Stanislaus Water and Power Company at Oakdale.

Late in the year 1907 he entered the United States Reclamation Service, and after a few years as irrigation engineer on the Umatilla project in Oregon, was assigned to the Orland project in this state which, under his regime as project engineer, became one of the most successful within the scope of the service.

Resigning as project engineer, he was appointed a consulting engineer by the Reclamation Service. For the next six years he was retained as a consultant by the service, and also was employed by the state as a consultant and special investigator of problems connected with California water resources. During 1924 he was employed as chief engineer of the Hollister Irrigation District and in 1927 returned to the state service as irrigation engineer and remained in that position until his death.

Mr. Burch was a recognized authority in irrigation matters. Naturally of a retiring nature, he was respected by all who knew him for his wide knowledge and sound common sense and loved for his unfailing kindliness and subtle sense of humor.

HIGHWAY BIDS AND AWARDS

(Continued from page 31)

to Peninsula Paving Co., San Francisco, Alt. "A" $202,613.50.

SOLANO and SAN JOAQUIN COUNTIES—At various valley locations on the westerly side of the San Joaquin Valley, Diesel oil to be applied to roadside vegetation for a distance of about 128.1 roadside miles. Dist. X. Hayward Building Material Co., Hayward, $2,797; Oilfields Trucking Co., Bakersfield, $2,908. Contract awarded to Sheldon Oil Company, Suisun, $2,208.90.

SONOMA, MARIN, NAPA and SOLANO COUNTIES—Apply Diesel oil to roadside vegetation over a distance of 197.2 roadside miles. Dist. IV, various routes and locations. Oilfields Trucking Co., Bakersfield, $8,190; E. A. Forde, San Anselmo, $5,850; Chas. Kuppinger, Lakeport, $6,214. Contract awarded to Basalt Rock Co., Inc., Napa, $5,408.

STANISLAUS, MERCED and MARIPOSA COUNTIES—At Various locations, Diesel oil to be applied to roadside vegetation for a distance of about 141.4 roadside miles. Dist. X. Oilfields Trucking Co., Bakersfield, $2,562; Hayward Building Material Co., Hayward, $2,782. Contract awarded to Sheldon Oil Company, Suisun, $2,425.50.

There were approximately 320,000 retail gasoline outlets operated in the United States last year, according to figures.

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Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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Port of Eureka—William Clark, Sr., Surveyor

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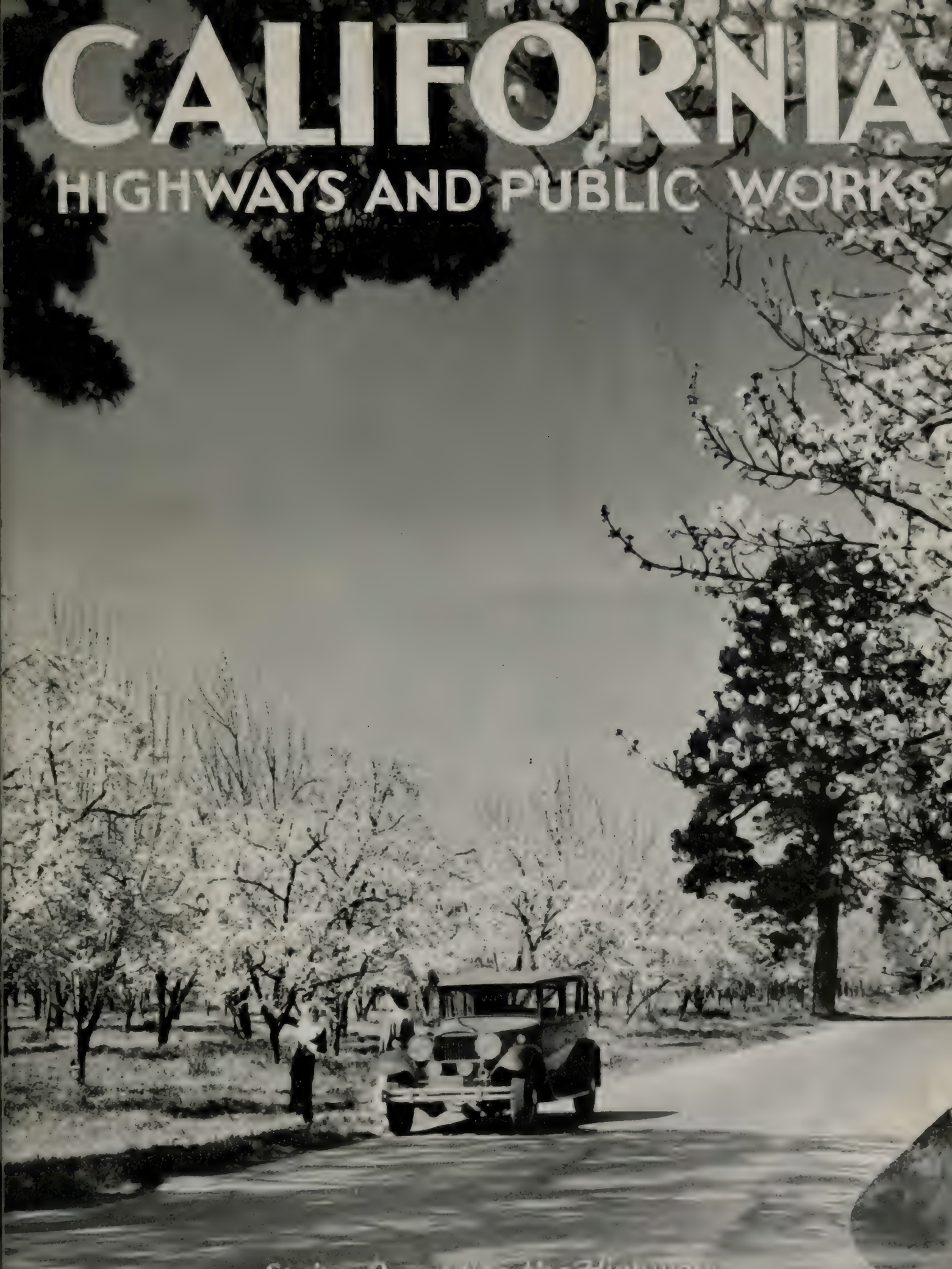
CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



Spring Beautifies The Highway

Official Journal of the Department of Public Works

APRIL 1936

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APR 25 1936

New Era in Design and

Construction of Highways Being

Developed By Varied Demands

of Modern Traffic Conditions

By **JUSTUS F. CRAEMER,** Assistant Director, Department of Public Works

THE END of the first quarter of the year 1936 finds the planners and builders of highways throughout the nation facing the realization of the fact that we are entering upon a new era in highway designing and construction.

Since the advent of the automobile, development of construction fundamentals for building durable and suitable roads for the new form of transportation has mainly engrossed the engineering minds of Federal, State and industry highway agencies.

The results of years of research, experimentation and experience are represented in the modern high type standard highways.

The ulitarian and economic values of these modern highways have been firmly established, as well as the need for thousands of additional miles of them all over the country in farm and suburban areas "still in the mud." But in the past few years other fundamental factors have been thrusting into the foreground to develop in the engineering mind a new picture of the highway of the future.

These factors shift the responsibility, in a large degree, from the field of construction into the field of designing, planning, financing and traffic control, an important and comparatively new field in its larger aspects.

Major compelling factors are: ever increasing demands of modern transportation for more spacious highways adequate to accomodate multiple lanes of traffic; provision for free and safe movement of slow and fast traffic; separation of railway and highway grades at intersections; grade separation of through and local motor traffic at major arterial intersections; more safety features in design and equipment; separation of opposing traffic on all multiple lane highways and reasonable application of the principle of a pay-as-you-ride-per-mile tax upon highway users as represented by the gasoline tax when expended solely for highway purposes and not diverted to other governmental agencies.

JUSTUS F. CRAEMER

Having gradually emerged from the experimental stage of road building, and realizing that less than one-third of our highway mileage in the State, considering all public roads, is surfaced, it is not enough that we proclaim our present and future needs. We must have an intelligent and scientific approach to the problem, with due regard to all interests involved.

There must be a definite relationship

(Continued on page 14)

State Building Highway Link to Site of 200-inch Telescope on Palomar Peak

By **E. E. WALLACE**, District Engineer

CONSTRUCTION by the State Division of Highways of an essential link in the road to the summit of Palomar Mountain in San Diego County, the contribution of the California Department of Public Works toward increasing scientific knowledge of the universe, and which will make possible transportation to the peak of the famous 200-inch telescopic mirror and thousands of tons of material and equipment for the world's largest astrophysical observatory, now is under way.

The observatory site is at an elevation of 5568 feet and at present is accessible only over a tortuous trail from a road being built by the county of San Diego. The work undertaken by the State will, when completed, provide the final connection with the site and also furnish an approach to the Palomar Mountain State Park.

More than eight years ago the Rockefeller Foundation appropriated funds for an observatory intended to eclipse any in existence. Five years were devoted to the task of selecting a site. The location on Palomar Mountain, comprising 720 acres, finally was chosen as the most suitable.

In order to secure the observatory, San Diego County authorities agreed to provide a road to the site, and the work of improving adjacent county roads has been in progress for the past year. A new road connecting with the secondary State highway to Oceanside is being constructed by San Diego up the south side of Palomar Mountain and a total length of 11.8 miles of maintained road must be completed in order to provide proper access to the site.

This obligation placed quite a burden upon San Diego County and so the last link of the road, designated as San Diego County's Feeder Road Project, is being financed with Federal funds, which have been apportioned to the State of California under the Emergency Relief Appropriation Act of 1935, and is being constructed under the supervision of the Division of Highways.

PROVIDING RELIEF EMPLOYMENT

The Feeder Road Project involves the construction of 3.3 miles of mountain road with a 28-inch roadbed which will be surfaced with local materials. Approximately 150,000 cubic yards of excavation, mostly rock, will be moved under this contract. One of the purposes of the undertaking is to provide employment and the specifications call for 237,370 man-hours of employment.

Because of the unusual loads which will have to be hauled over the road, a rather high standard was required.

HEAVY OBSERVATORY EQUIPMENT TO BE MOVED OVER ROAD

Part	No. to be shipped	Width	Length	Height	Weight
Mirror and Cell	1	22 ft.	22 ft.	8 ft.	100,000 lbs.
Tube	1	23 ft.	48 ft.	23 ft.	125,000 lbs.
Girders	4	10 ft.	65 ft.	14 ft.	140,000 lbs.
Horseshoe	2	20 ft.	45 ft.	5 ft.	100,000 lbs.
Lower Grillage	1	23 ft.	30 ft.	6 ft.	75,000 lbs.
Cage	1	23 ft.	23 ft.	16 ft.	50,000 lbs.

The road has been located so that traffic using it will not interfere with the observatory work. The route traverses some heavily timbered country and approaches the easterly side of the Palomar State Park, which is a beautiful tract including 2.5 square miles on the top of Palomar Mountain.

AIRPORT TO BE BUILT

From the observatory site a wonderful panoramic view of the surrounding valleys and mountains, as well as of celestial bodies, is available.

An airport will be built adjacent to the observatory which will provide for plane landings for official visitors. Necessary buildings will include at least five cottages to house the observatory staff and provide quarters for visiting scientists; the observatory housing

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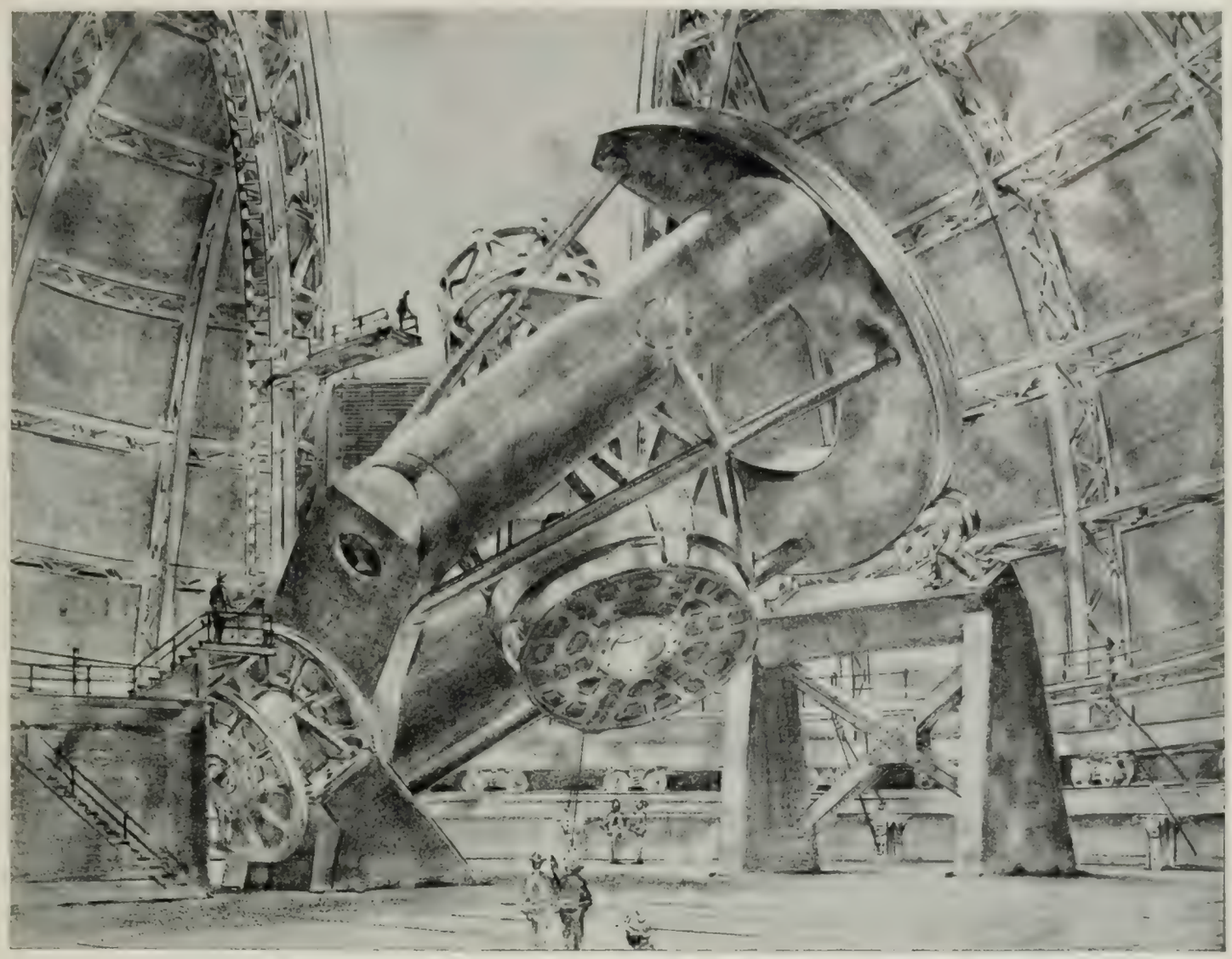


THE 200-INCH TELESCOPE as it will appear when completely assembled and mounted in the observatory on Palomar Mountain is shown in this picture supplied by the California Institute of Technology. The 200-inch mirror pierced with a central hole is shown in position at the base of the telescope tube.

PALOMAR MOUNTAIN OBSERVATORY SITE is at an elevation of 5568 feet. San Diego County is building a road 11.8 miles long up the south side of the mountain to connect with a State road to the site.

How 200-inch Mirror Will Function

(Continued from page 2)

for the 200-inch telescope and for the 18-inch telescope, the power house for the large telescope, a million-gallon water reservoir and a 75-foot water tower to provide adequate pressure for the entire site. The cottages will be termite, fire and earthquake proof and all other structures will be designed with equal precaution.

Work on the 18-inch Schmidt telescope observatory was started this month. The small telescope is to be a permanent addition to the 200-inch mirror telescope and will be used principally as a scouting instrument.

MIRROR HAS ARRIVED

Early this month the 200-inch mirror on which the eyes of the scientific world are now centered arrived in Pasadena from Corning, New York, on special cars. Three years will elapse before completion of the polishing and grinding of the mirror and before it is ready to mount in the observatory of the California Institute on Palomar Mountain.

The mirror is now at the California Institute of Technology at Pasadena where a special optical laboratory has been constructed in which the mirror will be ground. This building is lined with cork and is so constructed that no sunlight will be permitted to enter.

The three years during which the grinding and polishing are under way, the temperature within the laboratory will be controlled within very slight variations.

Recently a contract was let for the construction of the support for the world's greatest telescope to cost $1,750,000. The office of Dr. Robert A. Millikan of the California Institute of Technology forwards the following interesting information:

TOTAL WEIGHT 425 TONS

"The tube of the telescope, about 20 feet in diameter and 60 feet long, will weigh about 125 tons. This includes the 200-inch mirror, lying on a special support system at the lower end of the tube. The glass disc will weigh about 16 tons after it has been ground and polished.

The telescope tube must be rigid enough to carry an observer in the cartridge-shaped house at its upper end without flexure. It must also be mounted so as to turn freely to all parts of the heavens and to follow the stars automatically with great precision in their apparent motion from east to west. The total weight of the moving parts of the telescope, including gears and accessories, will be about 425 tons.

"Other optical combinations will enable the observer to photograph celestial objects or to study them with spectroscopes, photo-electric cells and special auxiliary apparatus at several different points. One of these is at the base of the telescope tube, below the 200-inch mirror, which will be pierced with a central hole 40 inches in diameter.

"Another point of observation will be in one of the cylindrical tubes which form parts of the fork within which the telescope tube hangs.

FIXED TEMPERATURE CHAMBER

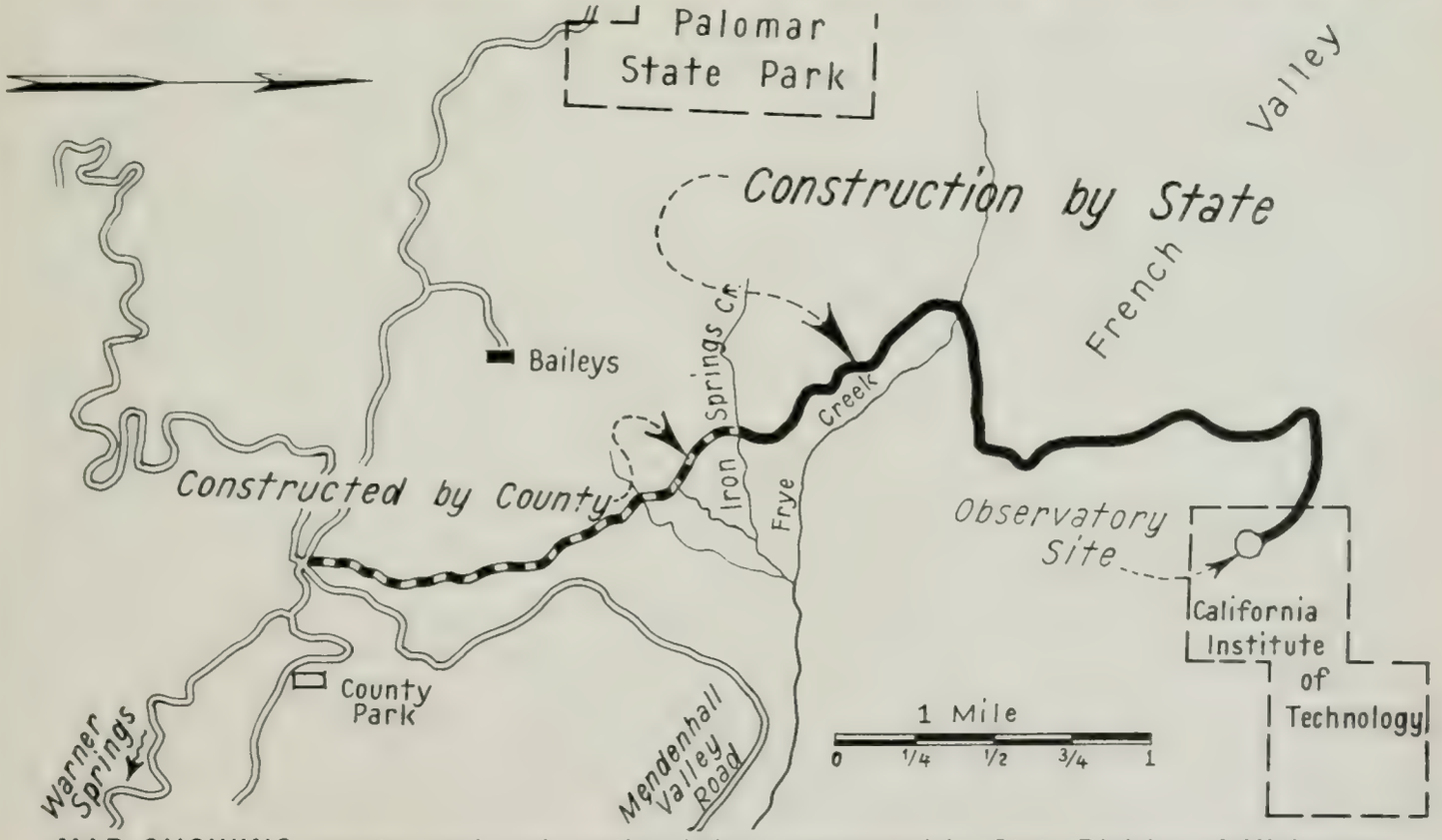
"Still another arrangement will permit the observer to work in a fixed constant temperature chamber at the south end of the polar axis. At this point the largest and most powerful spectroscopes will be mounted on a massive concrete pier.

"The entire telescope will stand within a dome 135 feet in diameter. By opening the shutters of this dome an aperture 30 feet wide, extending from the horizon to beyond the zenith, will provide a large window for observation. The lower cylindrical part of the building, fixed in position, will contain many rooms, laboratories and photographic dark rooms for various kinds of work. The dome will rotate on the circular rails at the summit.

"Contrary to many incorrect reports, the magnifying power of the 200-inch telescope will always be low or moderate. The advantage of this instrument will be its great light concentrating power. This will enable it to detect very remote celestial objects, and thus to increase our knowledge of the constitution of the universe and the nature of its apparent "expansion." The increased brightness of the images of stars and nebulae already known will permit their spectra to be photographed with spectrographs of higher dispersion than those now employed."

"Is this the Fidelity Insurance Company?"
"Yes, ma'am, it is. What can we do for you?"
"I want to arrange to have my husband's fidelity insured!"

TOUGH GOING on existing trail road to camp and observatory site on Palomar Mountain.



MAP SHOWING county road and portion being constructed by State Division of Highways.

CONTRACTORS' CAMP near mountain observatory site is a rapidly growing community.

1400 Miles of Highways Damaged by Storm Conditions of Past Winter

By **W. A. SMITH**, Assistant Maintenance Engineer

RECORDS of the Division of Highways reveal that the unprecedented storms of the past winter months caused more extensive damage to the highways than has occurred in any similar period in the history of the division.

Snow removal, slide removal, slipout replacements and repair of flood and storm damage during the four months from November 1, 1935, to April 1, 1936, have placed a severe drain upon maintenance funds, exceeding in cost any comparable five months' experience, and extensive repairs must be made, as funds become available on many of the damaged sections.

Heavy snowfalls were to be expected in the regular course and, with winter conditions, a certain amount of surface failures. The main, immediate concern, however, was and is the extent of land slides and slipouts throughout the state.

EXTENT OF DAMAGE

Roughly, about 10 per cent, or 1400 miles, of the State system was damaged and in a few cases completly destroyed. The cost of opening, refilling and replacing this mileage, in even fair condition, will exceed the total average amount provided for upkeep purposes.

The most severe storms have occurred in the central coast and valley sections. Unusual snow removal was necessary over Donner Summit, on U. S. 40, and from Bishop north to the State line on U. S. 395. During February, 161 inches of snow fell at Donner Summit and 159 inches at Crestview. In the southern part of the State, snowfall has, fortunately, been light and storm damage nominal, although even there the work of clearing the roads was a considerable item.

In the snow areas, damage to road surfaces and to cut and fill slopes was more severe than last year, due to relatively mild temperatures. While frost heaving of frozen, saturated subgrade is a source of serious damage to road surfacing, this action is intensified so far as cut and fill slopes are concerned during a comparatively mild winter. The ground is more completely saturated and there is a greater sloughing, with repeated freezing and thawing.

Under such conditions, the heavy snow removal equipment, which ordinarily would be supported by the frozen ground, considerably damaged the road surface and shoulders in clearing the roads east of the Sierras. This action, further intensified by the traffic, has caused failures, particularly along the pavement edges.

Extensive surface failures have occurred on State Highway Route 29, between Red Bluff and Susanville; on U. S. Route 299 between Redding and Alturas and on U. S. 395 between Litchfield and New Pine Creek, as well as many other locations. Expensive repairs must be made, as funds become available, on all of these sections.

For several years prior to 1934–35 and 1935–36 winter seasons, rainfall had been relatively light or occurred late in the season so that the new cuts and fills had not weathered and seasoned and damage was accordingly severe.

The areas where extensive slides and slips occurred follow:

SLIDE DAMAGE AREAS

In the San Gabriel Canyon, 20,000 cubic yards of rock slides closed the road for a short period. North of Pasadena, on the scenic Angelus Crest route, 16,000 yards has been moved. In Ventura County, the Casitas Pass route and the Ventura-Maricopa Highway, U. S. 466, were closed to traffic at various times. Between San Juan Capistrano and Lake Elsinore, a mud flow from a side canyon made the road impassible on several occasions.

In the San Luis Obispo district, several routes were closed. State Highway Route 80, through San Marcos Pass northwest of Santa Barbara, was closed for three weeks. On a three-mile section, the slide yardage averaged 6600 cubic yards per mile. On Route 56, between San Simeon and Carmel, in a distance of 30 miles 175,000 cubic yards of material either moved into the road or slipped out to destroy considerable distances. Of this quantity, 50,000 yards was concentrated in a three-mile distance, or 16,500 yards per mile. On Route 10, between San Lucas and Coalinga, the same conditions obtained.

TWO MAJOR SLIPOUTS

In the San Francisco district, there was 110,000 cubic yards of material on twelve State highway routes which it was necessary to move to protect the traffic and the highways. This does not include

(Continued on page 8)

SLIDES AND WASHOUTS of the past winter. At top—A typical slide removal job in Trinity County. Center—Rock slides closing San Marcos Pass. Bottom—Washout on Van Duzen River, State Route 35.

Major Damage Due to Slides and Slips

(Continued from page 6)

an entire cleanup but represents only the minimum to keep the roads open and in safe condition. Nor does this include the slipout at Inspiration Point on Route 5 near Santa Cruz and one on the Skyline Boulevard, Route 55, which are of major proportions. These two locations will require special study and financing. For the time being, traffic is taken care of satisfactorily by short detours.

A slipout on the All Year Highway, Route 18, closed the road west of Mariposa for a time and the same route was closed by slides near El Portal. Extensive damage occurred on the Mother Lode Highway between Mariposa and Bagby. During the time the All Year Highway was closed, flood conditions existed at Merced where U. S. 99, the main valley route, was under water both north and south of town to a maximum depth of 36 inches. Two floods occurred within a few days' time. Each flood considerably damaged the shoulders south of the city and made it necessary each time to detour traffic for many miles. One employee of the division was killed in flagging traffic.

On the Mother Lode, between Sonora and Placerville, the roadway was washed out at two locations and closed temporarily by slides, with many small slides which blocked drainage, and one slipout above Melones'. The same conditions were encountered on the road from Angels Camp to Dorrington, from Jackson to Pine Grove and west of Martell. There was considerable damage by high water south of Ione at Sutter and Jackson creeks, as well as between Ione and Waite's Station on Route 97.

FLOOD DAMAGE

In District III, slides on U. S. 50 above Placerville, a slipout near Baxters on U. S. 40, slides on Route 21, the Feather River route, and damage to the bridge across Cache Creek, and extensive slides on Route 50, as well as flood conditions between Sacramento and North Sacramento, and in the vicinity of Butte City, all taxed the resources of that organization.

In the Redding territory, damage was sustained throughout the district, with the worst slide conditions on the Weaverville and Peanut laterals, routes 20 and 35. Damage to road surfaces, particularly from Red Bluff to Susanville, Route 29; Redding to Alturas, Route 28; and Litchfield to New Pine Creek, Route 73, was more severe than in any of the other districts.

The Eureka District is organized to handle extensive slides each winter, but the 23 days of practically continuous rain in January caused more severe damage than usual. This damage was quite general on U. S. 101, with 350,000 yards of slides and slipouts, and an additional 300,000 yards on ten other routes in the district.

When storm conditions obtain, the maintenance organization is on duty twenty-four hours a day so that warning signs, lights and barricades may be placed to warn traffic, and the roads repaired so that the motorist may pass in safety.

This necessity is accepted by every man as a matter of course. It is not possible to give individual credit, but the public generally little realizes the long hours of hard and sometimes hazardous work which these men put in during storm periods, that traffic may be served.

The most severe damage occurred on newly constructed roads and the cost of replacement, although necessary to keep traffic moving, is in the nature of delayed construction. On construction of the type, now standard practice, it is impossible to foresee the effects heavy fills or deep excavation will have.

In the long run, therefore, it is perhaps more economical to meet the damage as it occurs rather than to spend large sums to insure that all cut slopes are stable and all fills on ground which will furnish support when saturated with water. In any case, it must be realized that a large sum must be set up each year to meet such emergencies, as a single slide or slipout may entirely close a road without warning.

INVOLVES EXTENSIVE REPAIRS

Under the conditions encountered, repair work involves much more than the simple replacement of a fill or removing a slide. In many cases, an investigation must be made to determine the underlying cause of the failure and measures adopted to correct such condition.

In one case, to protect a bridge, it was necessary to excavate a trench thirty feet in depth, place perforated pipe, backfill with rock and excavate an outlet tunnel under the road. Drainage of the slide area by cutting channels to insure quick runoff, excavating below the slip plane and placing of perforated pipe, construction of bulkheads, and similar measures are taken.

In some cases, control work is not possible where extensive volumes of earth are moving on a plane too deep to be accessible, but, in general, slide and slip conditions can be controlled by proper drainage.

In the past, it has been possible to secure considerable benefit through use of slide material in widening the fills, but widening has now reached the ultimate desirable in many places.

STORM DAMAGED HIGHWAYS. At top—Typical surface failure at mud slide on Coast Highway in Mendocino County. Center—Mountain stream diverted by blocked culvert wrecking highway. Bottom—Shoulder of Golden State Highway washed out by flood near Merced.

Trees on State Highway Saved From Destruction by Western Pine Beetle

By **E. L. STUMP,** Maintenance Superintendent, District II

THE destructive effect of the activities of the Western pine beetle (*Dendroctonus Brevicomis*), commonly known as the yellow pine beetle, had been noted for many years by the writer, principally on State Route 29 (Red Bluff-Susanville lateral), in the vicinity of Mineral.

Experiments in treating infested trees were begun in 1931 and have advanced far enough, I believe, for us to draw some valuable conclusions as to effective methods for coping with this devastating insect pest.

Data as to whether this particular area is abnormally infested is not available, but I believe not. Bulletin No. 7 of the State Department of Natural Resources estimates the annual destruction of yellow pine stumpage in California as 200,000,000 board feet of the highest quality timber.

TAKING HIGH TOLL

Our experiments were confined, of necessity, to the State right of way and maintenance yard sites and the toll taken of adult yellow pine was found to be extremely high, in some areas as high as 20 to the mile in 60 and 80 feet right of way. The dead trees become a menace to traffic and are removed by the maintenance crews so that in their gradual elimination the loss is not apparent. However, our rights of way in the yellow pine belt are gradually being stripped of the finest specimens.

A brief life cycle of the Western pine beetle quoted from Circular No. 143, U. S. Department of Agriculture, follows:

"The beetles begin to fly and attack the trees in June and continue the attack until October or November. The first generation develops and emerges in August to November and the second generation passes the winter in the trees that are killed by it in the summer and fall. The foliage of the infested trees begins to fade and turn yellow in a few weeks after being attacked. The summer broods of the first generation leave the trees by the time the foliage is reddish brown, but the over wintered broods do not emerge until the following May or June, in some cases several months after the foliage is brown."

FIRST METHOD EFFECTIVE

Further seasonal history may be found in Bulletin No. 83, U. S. Department of Agriculture, "The Western Pine Beetle."

In 1931 two infested yellow pine trees on State right of way near Mill Creek, Route 29, were treated. The methods used consisted of drilling in at the pitch tubes (entrance holes) with hammer and chisel, then tracing the egg galleries by chipping through the outer bark and destroying all borers found. The egg galleries were then disinfected with fly spray to kill the eggs and the chipped out galleries sealed with tar or asphalt.

This method proved effective in saving the two trees but was very expensive (about $13.50 for a 5-foot diameter tree) and was also very disfiguring to the tree.

From that date thought was given to the development of some less expensive and less mutilating method of combating the beetle.

CIRCUMFERENTIAL BORINGS TRIED

The first experiments undertaken consisted of circumferential borings at the base of the tree through the outer bark and cambium layer and one-half inch into the sap. Half-inch pipes were placed in the borings at an angle of 45° from the vertical and the pipes filled with a 10 per cent solution of "Black Leaf 40" by means of a funnel.

It was believed that action of the sap would carry the poisonous solution up through the cambium layer, on which the beetle feeds, thus causing an internal poison to the pest.

In the spring of 1934 in conjunction with Mr. Whittaker, Assistant State Aboriculturist, areas of bark on trees under treatment since 1933 were removed and many dead beetles found which were subsequently taken to the State laboratory and identified as Western pine beetle. Of the 12 trees under treatment at that time none have died to date. Ordinarily a tree will be girdled and die in one season or two at the most.

COST GREATLY REDUCED

Although the circumferential borings gave better results when placed close together this method proved somewhat cumbersome.

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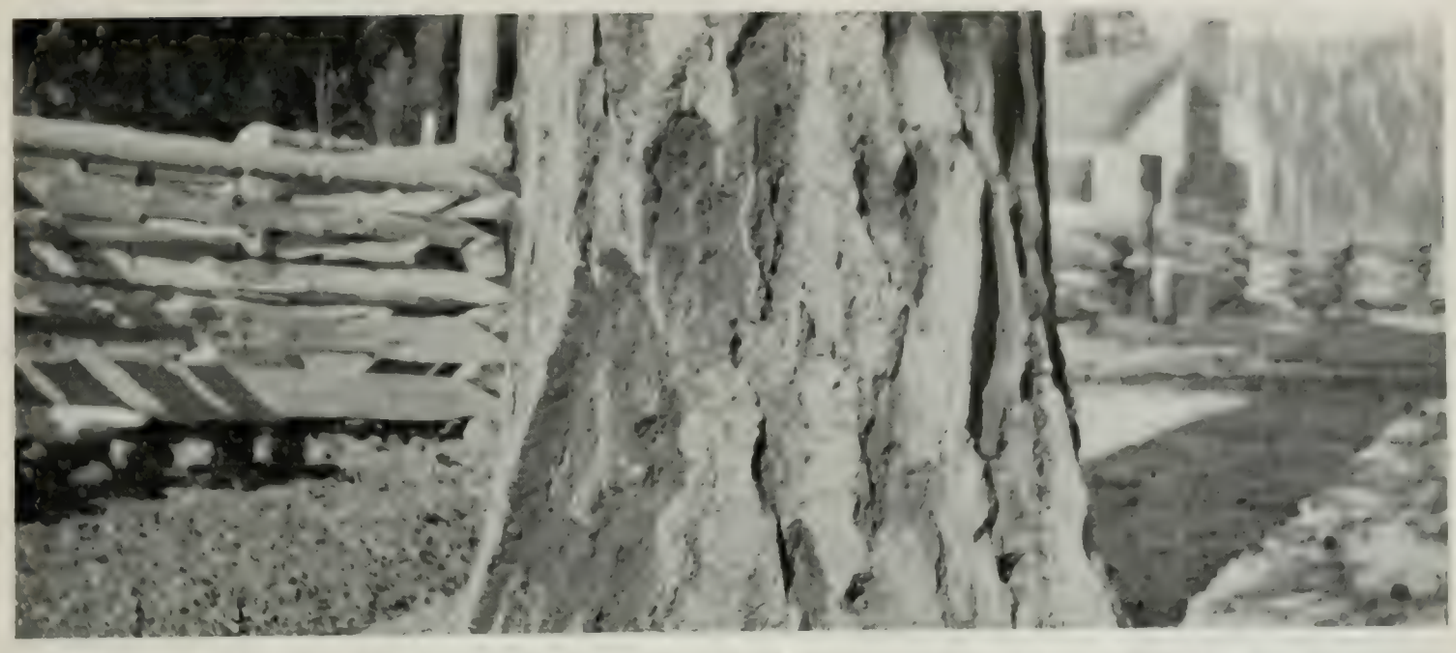
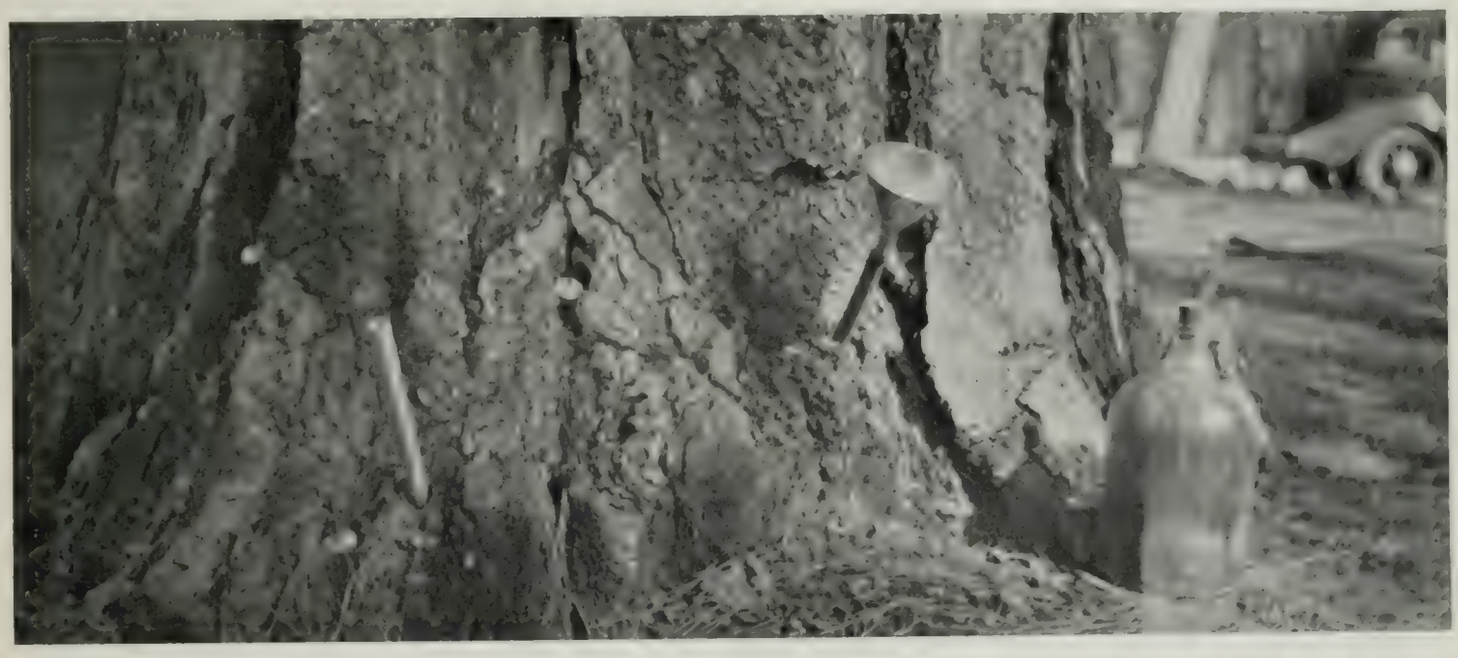


HAMMER AND CHISEL method used in 1931 to destroy pine beetle borers left tree mutilated.



PIPE INJECTOR METHOD for poisonous liquid tried in 1933 reduced cost from $13.50 to $3 a tree.

CORK METHOD of circumferential borings filled with solution adopted in 1935 is less cumbersome.

New Bridge Supplants Span Where Only Woman Ever Hanged in State Met End

PROGRESS and the State Division of Highways, marching together into the historic mining town of Downieville in Sierra County, have relegated to minor importance the famous pioneer bridge across the North Fork of North Yuba River, gateway to the mountain hamlet for traffic from Truckee, Sierraville and Sierra City, and scene of the lynching of the only woman ever hanged in California.

Since early days, Jersey bridge has afforded ingress to Downieville for travelers coming from points east. For 85 years it has been pointed out to tourists as a landmark of rather unenviable history, as the spot where on July 5, 1851, following an hilarious Fourth of July celebration, a Mexican woman, known only as Juanita, met death at the end of a rope for the killing of Jack Cannon, popular citizen of Downieville.

The original Jersey bridge was partially destroyed by a flood that swept down the North Yuba River in the early 80's, but, nevertheless, to the people of Downieville the present ancient, rebuilt structure is a connecting link with the romantic, glamorous and turbulent past of Sierra County.

OLD BRIDGE INADEQUATE

Now its importance as a vital part of Primary State Highway Route 25 between Nevada City and Downieville has been usurped by a modern reinforced concrete bridge constructed by the Division of Highways. This improvement was necessary to eliminate dangerous curves on the highway within the confines of the town, and at the approaches at both ends.

The line change on the highway was graded to a 24-foot standard roadbed and will be surfaced 20 feet in width. The new bridge is a reinforced concrete girder type, 160 feet long, with a 24-foot roadway and 4-foot sidewalks on each side.

An interesting feature of the construction was the selected stone embankment placed along the exposed sides of the fill between the bridge and the easterly end of the project. The material for the protection was obtained by widening and easing the alignment of the highway at Cannon Point, one of the worst of the many curves on the highway.

While the line change is only 0.4 of a mile in length, it removes a dangerous traffic hazard and replaces a bridge inadequate for modern traffic. The old route passed through the main street of Downieville, which is extremely narrow and further constricted by parked cars. Three sharp turns were necessary in traveling the former route, besides a crossing of the river over the old Jersey timber truss, which permitted of one-way traffic only and was posted for maximum loads of 8000 pounds.

FEDERAL RELIEF FUNDS USED

The total cost of the project, including the estimate of surfacing and oiling to be done this spring, is $59,330, of which $35,000 was financed from the 1935 apportionment of Federal Employment Relief funds, and the balance from the budget item of $75,000 for the 87th-88th fiscal year construction listed as "Nevada City to Downieville, portions."

G. A. Crayton was resident engineer in charge.

The hanging of the woman, Juanita, aroused a storm of protest back in 1851, newspapers throughout the civilized world editorially condemning the affair. Even the London *Times* of that period had a scathing article on the subject. In this state the controversy raged for several years, the issue became a political one because of the presence at the lynching of John B. Weller, afterwards Governor of California, and the state was long divided into two camps composed of those who held the hanging justified and those who denounced it.

The official history of Plumas, Lassen and Sierra counties in the State Library after describing the hilarious Fourth of July celebration of 1851, says:

"Later in the night these jolly spirits became mischievous, and some of the rougher sort went around breaking open doors of houses, among others the domicile of the ill-fated Juanita. In the crowd was Jack Cannon, a Scotchman of magnificent physical strength and herculean proportions. When the hilarious band broke up at a very early

(Continued on page 19)

New reinforced concrete girder bridge on realigned State Highway across the North Fork of North Yuba River at Downieville.

Old Jersey Bridge at Downieville, scene of the hanging of Juanita, the only woman ever hanged in California.

State Using Divided Highway Design

(Continued from page 1)

between necessary roads and ascertained present and future traffic needs. Road building must be based on economic justification. Here, indeed, is a proper and logical place for planning. This emphasizes the importance of planning surveys we already have conducted and are continuing, in cooperation with the United States Bureau of Public Roads.

If this course is followed we can proceed with the assurance that every mile of new road and every mile of new surface will earn a fair return. That is the basis on which we now are proceeding with our highway construction.

TASK BEFORE US

The immediate concerns of the California Department of Public Works are:

1 To bring up to adequate standards our present highway system which includes approximately 7,600 miles of county roads added by legislative enactments since 1931.

2 To satisfactorily serve the traffic which has developed on these highways and to protect the State's investment in this sytem amounting to some $300,000,000 by adequate maintenance.

3 To develop our highway system to meet the increasing traffic and safety demands of automobile and motor truck transportation.

In order that these objectives may be satisfactorily and economically accomplished, planning of future highway development will be predicated upon facts revealed by the present and continued extensive traffic surveys which we are conducting, and upon exhaustive studies of the causes of highway accidents.

The demand for adequate traffic facilities and for increased safety for such traffic presents immediately the necessity of conserving the funds now provided for highway improvement because, aside from the betterment and improvement which may be applied to the large mileage of secondary roads on our State highway system, many sections of our main trunk lines are urgently in need of reconstruction, widening, and resurfacing to bring them to a status which will properly serve even present traffic needs.

MEANS ADDITIONAL EXPENDITURE

To include in our designs additional safety factors beyond those which are now provided by high standard alignment and grade, as well as width of roadway, we must also be prepared to face additional expenditure.

This may be illustrated by a design feature which is now receiving greater attention and is being urged for consideration, namely the divided roadway design providing separated lanes of traffic in opposing directions.

A properly functioning road of this design would be a four-lane road in which a center strip or parkway is introduced, dividing the road into two two-lane roads and eliminating the opposing traffic hazard.

It is obvious that such design would immediately involve additional cost, first, in additional width of right of way, second in additional width of grading, and in several other features involving construction.

EXAMPLES IN CALIFORNIA

This type of roadway is not of recent conception but has been gradually developed, some instances of it dating back in individual installations for a number of years. There are several examples now existent on the State highway system in California; two sections in San Diego County, on the Torrey Pines mesa and north of Encinitas, having been in use for a number of years.

Other installations are either now in progress of construction or contemplated in the near future, as on the East Shore Highway through Oakland, Berkeley, Emeryville, and Richmond, from the San Francisco-Oakland Bay Bridge distribution structure northerly to San Pablo Avenue in Richmond and on the east bridge approach itself.

More important, perhaps, than the immediate installation of such a type road is our economic study and development of road designs which will permit the progressive expansion of our highways, in conformity with the traffic demands made upon them, so that we may ultimately achieve this type of divided roadway when traffic volume justifies it, without loss of initial investment. Such studies are now in progress and such designs are being placed under construction at the present time.

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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY-----Director
JOHN W. HOWE-----Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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GAS TAX DIVERSION

The Hayden-Cartwright Act provided that "Federal aid for highway construction shall be extended only to those states that use at least the amounts now provided by law for such purposes in each state from state motor vehicle registration fees, licenses, gasoline taxes, and other special taxes on motor-vehicle owners and operators of all kinds" for highway purposes, except that no state shall receive less than two-thirds of what it otherwise would receive in Federal funds. The effect of this provision was to "peg" diversion of highway funds at the mark existing when the law became effective.

This left the states that were diverting portions of their highway revenues to other purposes free to continue such diversion at the level then prevailing. It is now apparent that the motoring public is resentful that the guilty states are continuing to divert portions of their highway revenues and a nation-wide revolt has developed from a spontaneous sentiment existing among all who are being "short changed" on their highway revenues.

There is an abundance of evidence to prove that a considerable portion of the highway traffic accident toll is due to this diversion of highway revenues. Many roads that are unsafe because of lack of improvement to meet modern traffic conditions could be made safe if all money collected from gasoline taxes and motor vehicle license fees were used for road construction and maintenance. There is a growing demand that safety be built into highways to the fullest possible extent.—*American Road Builders Association.*

British Psychologist Ascribes Accidents to Split Consciousness

THE British are also wrestling with the problem of highway accidents and the following discussion of a psychological theory advanced as a possible solution is made in an editorial article in the magazine Roads and Road Construction published in London:

> The theory has long been held that certain people, by reason of innate clumsiness or some other mental abnormality, are more subject to accidents than others. In a few branches of human activity it is susceptible to proof. Whether a similar phenomenon existe in relation to road accidents is a question which has often been debated. Personally we are inclined to doubt it.
>
> TERRIFYING ASPECT
>
> But a new and more terrifying aspect of the subject is opened out by the latest theory of psychologists as put forward by one of them in a recent letter to the "Times." According to this theory, "there is a very large range of individuals for whom accidents can be regarded as symptoms of a temporary dissociation or splitting of consciousness—a condition against which very few minds are absolutely secure."
>
> So far, so good; for in plain English we take this to mean that everyone loses his head occasionally. What follows is more startling. "Quite often these accidents are so accurately timed to accompany an impending subjective crisis that they can only be described as unconscious suicidal attempts." In other words, if you have just been sacked by your boss or lost heavily on the Stock Exchange—well, just be careful how you cross the road.
>
> The correspondent goes on to say that the normal response to this condition is to exact from oneself a higher degree of caution, but that certain individuals react with an increased recklessness born of a headstrong belief in their complete rightness and security.
>
> RECKLESS COURT ACCIDENTS
>
> We have always urged strongly the application of science to the study of road accidents, but we confess we are disappointed if this is the best that psychology can do. It does not require profound wisdom to see that the reckless driver courts disaster and the cautious one avoids it. Nor is it any less plain that the majority of accidents are due to a momentary loss of judgment on the part of one or both of the victims. It is interesting to note, however, that psychologists are on the track of the causes of this loss of judgment; if they can follow up this line of investigation and determine the condition under which it is most likely to occur they will perform a real service to the cause of road safety.
>
> Meanwhile the road engineer is left with the baby; for it is his duty to discover the means by which road users can be saved in spite of themselves.

Traffic Cop: "Lady, don't you know this is a safety zone?"

Woman Driver: "Don't be silly! Of course, I know. That's why I drove in here."

Dramatic Operation Marks Closure of Final Bay Bridge Cantilever Gap

By **C. H. PURCELL,** Chief Engineer

THE LARGEST cantilever bridge in the United States—third largest in the world—was closed late last month. And with its closure, two of the most populous centers in the far west were joined by a chain of steel—San Francisco and the east bay empire. The Victory Highway (U. S. No. 40) technically, if not yet practically, now stretches from the Atlantic to the Pacific

The San Francisco-Oakland Bay Bridge is a reality, and an 80-year old dream has been fulfilled.

Next to the sinking and anchoring of the caissons for tower foundations on the west bay crossing, the closing of the cantilever of the east crossing was probably the most ticklish job in the construction of this world's largest bridge.

WEATHER LENGTHENED MEMBERS

First, it was the longest cantilever to be suspended, and the heaviest; 1400 feet in its total length, it weighs 21,000 tons. Second, changing weather and tidal conditions made the closing of the gap difficult to calculate to a nicety.

At one time during the closing, for instance, with a cold wind blowing through the Golden Gate on the west and a warm sun on the east, one side of the structure was as much as four inches longer than the other.

From Tower E-2 near Yerba Buena Island and from Tower E-3 east of it, traveling derricks had moved slowly toward each other, lifting steel members from barges approximately 195 feet below. Week after week bridgemen fitted these steel members and bolted them into place, until about 625 feet of steel, weighing around 10,000 tons, were suspended from each tower.

It remained now to close the gap of 96 feet.

And one morning, while commuters looked on, the eyebars of the lower chord were lifted and slipped into place and the first juncture completed.

Not so spectacular but even more exacting was the completion of the final closure which was accomplished on March 25.

Following the placing of the lower eyebars and steel members (such as horizontals) sufficient to give the structure support, but the minimum weight, four steel pins, about one-half ton in weight and three feet in length, were to be driven and the upper chords placed and bolted.

Here the eight giant hydraulic jacks, each exerting a "push" of 500 tons, which had been temporarily installed for just this purpose, came into play. Four of these jacks were located at the top of the split steel bent on Tower E-4. With these it was possible to push or pull an entire half of the bridge east or west. It was these horizontal jacks, 1200 feet away, that jockeyed the eyebars into position so that the steel pins could be driven through, thus securely fastening the lower chords.

BRIDGE CLOSED BY JACKS

The four remaining jacks with a longitudinal action had been placed at each end of the upper chords of the cantilever arms.

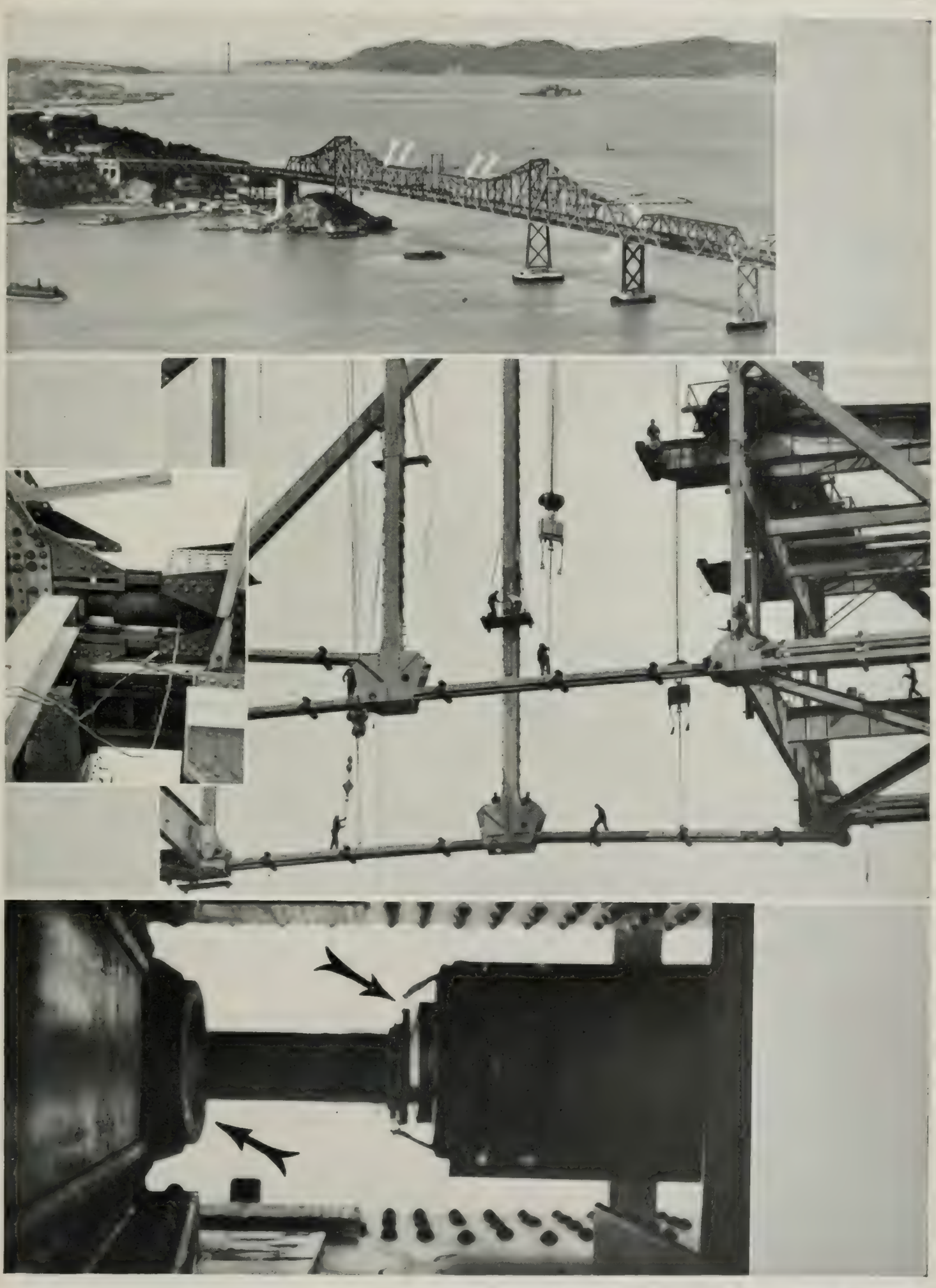
It was now necessary to bring these into operation to adjust the arms of the cantilever so that the upper chord could be slipped into place and bolted. This was done just as we had calculated, and not until then, to the engineers, was the bridge closed.

Operations during the procedure of this final and delicate work, were directed by engineers stationed with a full view of the project, through telephone communication to operators on the jacks several hundred feet away.

Remains now the placing of additional steel members, the installing of the floor steel and the paving. And it will not be long before the entire cantilever section can be pronounced completed.

ST. LAWRENCE CANTILEVER LONGEST

Other cantilever bridges longer than that of the San Francisco-Oakland Bay Bridge are the 1800-foot span built for railroads and a highway across the St. Lawrence River near Quebec, Canada, and the Firth of Forth Bridge in Scotland, which has two cantilevers each 1710 feet in length.



Center Photo Courtesy San Francisco Examiner

JACKS DID IT—The first steel to close the gap of the Bay Bridge 1400-foot cantilever span were the eyebars on the lower chord shown in the center picture and the steel worker on what appears to be the lower bar was the first man to walk across. The bars were fastened after they were jockeyed into position by powerful jacks shown in insets and located as marked in upper picture.

Gas Tax Regarded as Tax by the Mile

(Continued from page 14)

The State highway system in California includes approximately 14,000 miles of roads. Originally, state highway work was financed by bond issues and motor vehicle registration fees. The three bond issues voted by the people aggregated $73,000,000. Since 1923 construction and maintenance operations have been paid for by gas tax and registration fees on a pay-as-you-go basis.

Present sources of revenues for State highway work in addition to federal aid are: One-half of the net revenues from motor vehicle registration fees after funds for the support of the Motor Vehicle Department and the California Highway Patrol have been deducted, and two cents of the three-cent State gas tax after deduction of the cost of collection and refunds made for exempt gasoline tax uses.

One-half cent of the two cents of State highway gas tax revenues must be expended within incorporated cities on the basis of the population which each city has to the total city population in the State. One-quarter cent is for use on State highway routings within the cities and one-quarter of a cent is for streets of major importance within cities.

The net gas tax revenue of 1½ cents is all that is left for application to State highways outside of incorporated territory.

The revenue derived from one cent of the gas tax raises approximately $12,000,000 per year. The approximate amount at this time of State highway funds which are expended within cities is $6,000,000 per year, or $12,000,000 per biennium.

MATCHING FEDERAL AID

Regular Federal aid is a contribution from the Federal government, depending upon appropriations made by Congress and requiring matching of Federal moneys by State moneys. These funds are applicable only to a system of roads included in a Federal Aid system, agreed upon between the State and the national government. It is not extended to a State until it is earned and can only be collected after the work has been done with State funds. In California the approximate cooperation amounts to 50%, or dollar for dollar matching.

Admittedly, the gasoline tax is a fair tax. It is a just tax for highway purposes. Its diversion for any other governmental function manifestly would be unjust not only to those who pay it, but to the State which would be deprived of all future Federal aid, and to all the voters of the State who have twice voted overwhelmingly against diversion in two successive elections.

Concerning the fairness of the gas tax and the indefensibility of any proposal to divert it to purposes other than highway construction and maintenance, Roy F. Britton, Director of the National Highway Users Conference, Washington, D. C., has this to say:

TAX BY MILE

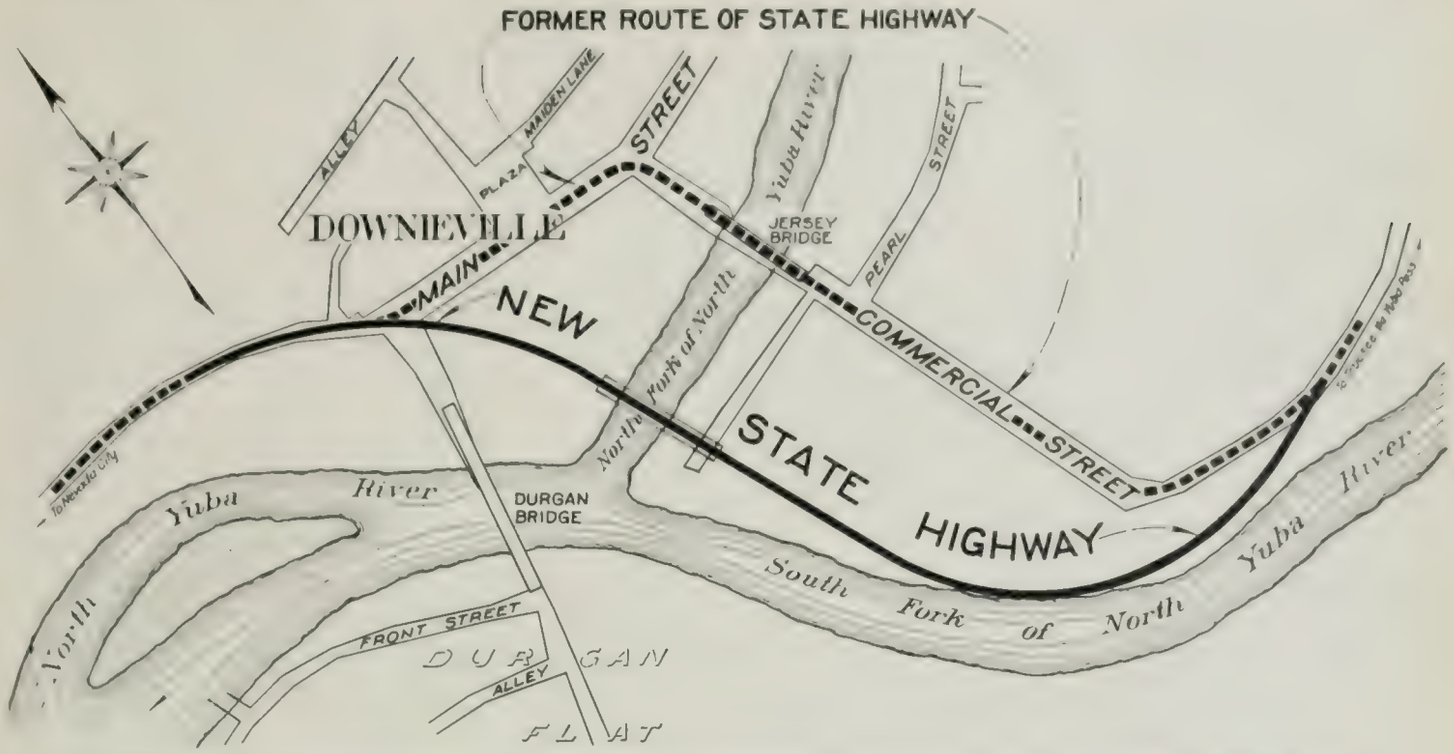
"The gas tax can be looked upon, in reducing it to its lowest common denominator, as a tax by the mile. You pay as you ride. When first imposed it was assumed you would ride as you pay; that's the theory of it.

"Measured by these standards it would be hard to point to taxes that are sounder or more defensible in theory than the two principal motor vehicle tax levies—registration fee and gasoline tax.

"The principle of the motorists' taxes by the mile is sound. It is my contention that there is no sounder tax that could be devised than a levy predicated on the theory that you pay for the facilities which you use as you use them; that you pay as you travel. These taxes are entirely proper for road construction, maintenance and administration, but they are entirely improper and indefensible as a source of revenue for general governmental needs, however urgent those needs may be.

"Whenever diversion occurs, taxes by the mile becomes the sales tax on a special class—a discrimination and a mockery."

If the plans of the Department of Public Works and the Division of Highways for the future are to be successfully carried out there can be no diversion of gas tax funds, for, in addition to providing adequate transportation facilities, the department feels a pressing responsibility to help by every means in its power in reducing the number of traffic accidents and fatalities which today have reached a high figure in California.



MAP SHOWS HOW new State route avoids narrow congested city streets in Downieville.

Woman Hanged in Early Days at Downieville

(Continued from page 12)

hour the next morning. Cannon went back to the Mexican house. His purpose in returning thither is, of course, unknown. Many persons say he intended to apologize and pay for the damage done by himself and fellows."

V. C. Murray, who witnessed the killing of Cannon, is quoted in the history as saying that Cannon entered into an argument with the woman and a Mexican companion. Juanita drew a knife from the folds of her dress and stabbed Cannon to the heart. There was high excitement when news of his death spread. A judge and jury were hastily appointed and two attorneys named for the "prosecution" and "defense." A young lawyer who pleaded for Juanita was manhandled by the mob. The woman was found guilty.

Continuing the account of the hanging, the history says:

"The woman was taken to her cabin and given one hour to prepare for death. Confronting with an unflinching, steady gaze the angry crowd surrounding her, she sat the whole time. When her hour was up, she was called forth and passed fearlessly down the street, chatting and smiling with as much ease as anyone there.

"From the top of the Jersey bridge a rope dangled over the side, while beneath it a timber six inches wide was lashed to the bridge and swung out above the stream. Three thousand excited spectators were present, many of whom now live to tell the tale.

"On the plank Juanita stood, quietly surveying the crowd. Perceiving a friend, she took off her Panama hat and gracefully flung it to him, bidding him good-bye in Spanish. She took the rope in her own hands, placed it about her neck and adjusted it beneath her beautiful black hair with her own fingers. A white handkerchief was thrown over her face, her hands tied behind her, and at each end of the plank, ax in hand, stood a man ready to cut the lashings. Another fired a pistol as a signal, and the axes fell. She dropped three or four feet, meeting death with scarcely a struggle."

George Barton of Downieville, who witnessed the hanging, wrote of the incident in verses which in part read as follows:

"Gayly she climbed the fatal pile;
To one she knew, with graceful bend,
Flung him her hat, and with a smile,
'Adios, amigo'—good bye, friend;
And pressed the noose beneath her hair,
And smoothed it down with steady palms;
Life making up her toilet there,
Ere death embraced her in his arms."

Concluding his poetical story, he wrote:

"Stern winter brought its angry flood
That madly rushed towards the sea;
That bridge went down, and yet the blood
Stain lingers; it will ever be
A mark—no matter where the blame—
To point the finger toward the spot,
When every witness, aye, each name,
Are unremembered, all forgot."

Ground Broken for Drawbridge on Proposed Lodi-Rio Vista Cut-off Link

By **C. J. TEMBY,** District Office Engineer

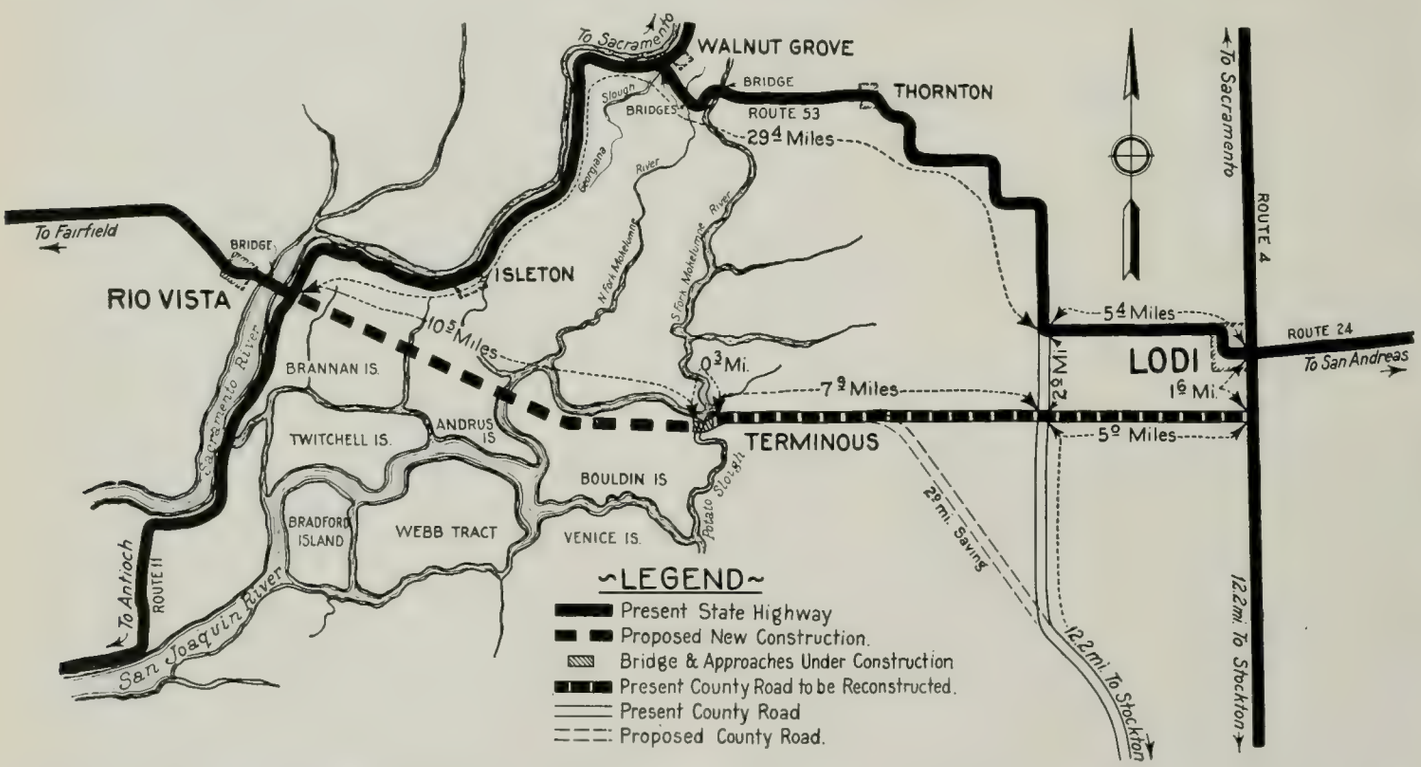
HERALDING construction of a proposed new state highway, to constitute a direct route from Cherokee Lane near Lodi to Rio Vista, passing through Terminous and crossing Bouldin, Andrus and Brannan islands, ground formally was broken at Terminous on Thursday, April 2, for construction of a drawbridge across Potato Slough, with FWP funds, which will be the first unit of work undertaken on this delta land cut-off project.

Groundbreaking ceremonies were attended by Earl Lee Kelly, Director of the Department of Public Works; Harry A. Hopkins, chairman of the California Highway Commission, and officials of the Lodi Chamber of Commerce and San Joaquin County.

The new highway is planned to replace the present one between Lodi, in San Joaquin County, and Rio Vista, in Solano County, via Walnut Grove, designated as State Highway Route 53. This winding road is 34.8 miles in length, is constructed on very low alignment standard and has several right angle turns with very short radius curves. Approximately 15 miles of it is on top of the Sacramento River levee.

SAVES ELEVEN MILES

The proposed cut-off route will be about 23.7 miles in length, or about 11 miles shorter than the present highway between Lodi and Rio Vista, which is considerably out of direction, deviating about 8 miles from a true line between the two terminal points. Because of its poor alignment and the fact that a large portion of it lies on the river levee, only minor improvement and general maintenance funds have been expended on this road.



SKETCH MAP SHOWS route of proposed cut-off highway route from the vicinity of Lodi to Rio Vista across three delta islands, saving 11 miles in distance.

At present there is no direct travelable road between Rio Vista and Terminous. Vehicle traffic through the islands is on narrow levee roads, necessitating several ferry crossings.

In addition to the bridge and approaches now under construction at Terminous, the proposed highway will require about 10.5 miles of new road between Terminous and

(Continued on page 32)

FERRYBOAT ON POTATO SLOUGH soon to be eliminated by modern drawbridge.

TURNING THE FIRST SHOVELFUL of earth in the groundbreaking ceremonies for the new drawbridge is Harry A. Hopkins, chairman of the California Highway Commission. Others are: Commissioner T. A. Reardon; Director of Public Works Earl Lee Kelly, who also did some shoveling, and District Engineer R. E. Pierce.

State Cooperating in Geodetic Survey to Bring Topographic Maps Up to Date

Foreword by **FRED GRUMM**, Engineer of Surveys and Plans

In the accompanying article Mr. Bowie describes the work of the U. S. Coast and Geodetic Survey, with special reference to California. The horizontal and vertical control surveys of the Geodetic Survey, are the basis for the topographic mapping of the country. Many engineering activities, including those of the State Division of Highways, find these surveys very valuable. The level lines and bench marks established on these lines have afforded benefits which more than justify any expenditure the State has made in cooperation with the Survey. The topographic maps developed on and from these surveys are decidedly useful in highway work and save the State considerable expense which would have to be incurred in preliminary surveys and investigation were they not available.

We have found our cooperation with the U. S. Coast and Geodetic Survey, through Mr. Bowie and Commander T. J. Maher, the Surveys Inspector at San Francisco, not only beneficial but pleasant.

By **WILLIAM BOWIE**, Chief, Division of Geodesy, U. S. Coast and Geodetic Survey

IN the extension of a great network of lines of first and second-order levels over the United States by the U. S. Coast and Geodetic Survey, California has not been neglected. There are now approximately 250,000 miles of lines in the net, and 13,500 miles of these lines lie within the State of California. This represents 6 8 0 0 miles of first-order and 6700 miles of second-order lines.

WILLIAM BOWIE

Of the 6800 miles of first-order lines completed, between three and four hundred miles were run by the Metropolitan Water District of Southern California. Of the 6700 miles of second-order leveling, approximately 1350 miles were run in Southern California to subdivide certain 25-mile areas to approximately 7½-mile spacing.

In addition to the above, approximately 1500 miles of first-order lines have been re-run in connection with seismological investigations in Southern California and in connection with the investigation of settlement in and around San Jose, which city is the county seat of Santa Clara County, California.

TWO FUNDAMENTAL CONTROL NETS

The Coast and Geodetic Survey is charged by law with the extension of the fundamental geodetic control surveys, triangulation and leveling over the entire country. The plan followed at the present time is to have the lines of first-order levels and the arcs of first-order triangulation spaced at intervals of approximately 100 miles and lines and arcs of second-order accuracy at intervals of 25 miles.

With this spacing completed we would have two very strong nets of fundamental control surveys that could be used as the framework for all classes of local surveys and for topographic mapping. The data are valuable for other activities of our people and especially in the location, construction and maintenance of highways.

The data resulting from the control surveys are, of course, of no value in themselves. They are only valuable when used. Much engineering work in this country has been undertaken without adequate survey and map data, chiefly because such data were not available. At present there is a great and growing sentiment throughout the country in favor of completing the standard topographic map within a few years. In the autumn of 1934

GEODETIC SURVEY LEVELING PARTY. The umbrella is to protect the instrument, not the observer.

the Federal Board of Surveys and Maps drew up a plan which, if followed, would provide for the completion of the standard topographic maps, based on adequate geodetic control surveys, for the entire country within the next ten years.

EXISTING MAPS WORTHLESS

At the present time only about 47 per cent of the country has been topographically mapped and at least half of the existing maps are so out of date as to be practically worthless.

There are many engineers and surveyors in the State of California who are very much interested in the results of the leveling operations. In 1932, the Division of Highways of the California Department of Public Works entered into an agreement with the U. S. Coast and Geodetic Survey whereby the State was to contribute one-half of the amount required for the pay of rodmen, etc., on two of the large leveling parties operating in California.

This was done in order to secure additional lines of leveling over routes mutually agreed upon which could not otherwise have been run by the Coast and Geodetic Survey for lack of funds. The total amount contributed by the Department of Highways was $7,000 and this was used on leveling run from May, 1932, to February, 1933, inclusive.

DETERMINING EARTH MOVEMENTS

The Coast and Geodetic Survey each year for the last twelve years has done some additional geodetic or control surveying in the State of California for the purpose of determining earth movements due to geological processes and to lay the necessary foundation for determining such movements in the future. The work has consisted of the extension across fault zones of closely spaced triangulation stations and bench marks.

By repeating observations over these arcs and lines at intervals in the future, it will be possible to learn whether or not there have been horizontal movements of the triangulation stations or changes in the elevation of the bench marks.

The lines of levels are run with high-grade precision instruments that make it possible to close circuits with very small errors. As the network of lines is completed and adjusted, any small discrepancies are distributed through the lines in order to make the results consistent. If the closing errors are larger than certain prescribed limits, the faulty lines are rerun in order to detect blunders or to reduce the effect of any aggravated accumulation of the unavoidable accidental errors of observation.

TWO-MILE BENCH MARKS

Substantial bench marks are set along each line of levels at intervals varying from one to three miles. The distance between bench marks on the leveling run during the past few years has seldom averaged as much as two miles. The present instructions call for an average interval not greater than one mile.

The bench marks are placed along highways and railroads and in many cases at road crossings. Invariably bench marks are established at or near railroad stations and in villages, towns and cities. The object in view in running the lines of levels is to establish bench marks and furnish descriptions and elevations of them to engineers and surveyors so that they may be used as starting points or check points for all grades of leveling necessary in carrying on engineering work or detailed topographic mapping.

PRESERVING BENCH MARKS

In spite of the substantial character of the bench marks and the inscribed bronze tablet marking each one of them, some are destroyed through the thoughtlessness of those who are engaged in various activities.

Lately, however, engineers and other officials of some state and county highway departments have instructed their working forces to respect the marks and if possible avoid removing them. The Coast and Geodetic Survey does not have an allotment of funds for the purpose of placing parties in the field to relocate bench marks or triangulation stations which are in the way of construction and that must be moved.

For this reason it is necessary to depend on the cooperation of engineering individuals and organizations throughout the country to assist in preserving the marks from destruction. As these marks are

(Continued on page 24)

Geodetic Survey Reveals Difference in Coast Sea Levels

(Continued from page 23)

placed not only for the use of government organizations but for the use of federal, state, county, city and private organizations and individuals, it is not unreasonable to assume that those organizations will be glad to assist in the preservation of the marks.

In any case where it becomes necessary to move a bench mark or a triangulation station and a field party of this bureau is at work in the locality, this party will make the necessary transfers. If no Coast and Geodetic Survey party should be working in the locality, the bureau tries to enlist the cooperation of the local authorities.

DESIRABLE PROCEDURE

When it becomes necessary to move a bench mark or a triangulation station, the desirable procedure is to inform the Director of the Coast and Geodetic Survey at Washington, D. C., by letter, concerning the necessity for relocating the mark and giving the designation, that is, the letters and numbers found stamped on the bronze tablet with dies and enough of the legend cast in the disk to enable this office to determine definitely the organization by which it was established.

In case the mark is one over which this bureau has jurisdiction, a new disk properly stamped is forwarded together with instructions as to the proper procedure in transferring the elevation, position, or both, as the case demands. With the help of engineers and surveyors, the percentage of casualties resulting from engineering construction will be very greatly reduced.

All elevations of bench marks in the control net are referred to the datum of mean sea level. A theoretical study made of the combined level nets of the United States and Canada, carried out in 1929, indicated that the mean sea level surface as defined by tidal observations at many stations on the Pacific, Atlantic and Gulf Coasts is somewhat warped and that the average elevation of mean sea level of the Pacific Coast is about 1.7 feet higher than the average elevation of mean sea level on the Atlantic and Gulf Coasts.

MEAN LEVEL FIXED

While this may appear to be quite a large difference, the country is also large and therefore it was possible to hold fixed as a zero elevation the plane of mean sea level at each of the principal tidal stations for purposes of adjustment. The distortion of the net caused by holding at zero the observed tidal planes of mean sea level at the principal stations usually did not do violence to any single line of levels. The rate of correction resulting from this procedure was so small that it is not noticeable in local engineering surveys and has no troublesome effect on extensive topographic mapping.

About 1400 more miles of lines will be needed to complete the 25-mile spacing called for by the present plan. However, there may be a few areas in the high mountains where the ideal spacing may not be realized for some itme to come but such areas are relatively unimportant and comparatively few in number.

As rapidly as possible after the field observations have been made, computations and adjustments are carried on in the Washington Office of the Coast and Geodetic Survey and the descriptions and elevations of the bench marks are published first in mimeographed form and later are printed in book form.

Owing to the sudden closing of the field and office work some months ago, when the emergency funds allotted to the Survey became exhausted, much computation and adjusting of field observations on triangulation and leveling remain to be done to obtain final positions and elevations.

South San Francisco Underpass Widened and Opened to Public

THE NEWLY widened South San Francisco underpass on the Bay Shore Highway was opened to highway traffic on March 12 with a colorful ceremony participated in by the local high school band, State Highway Commissioner Timothy A. Reardon and State Senator Harry L. Parkman.

When the old structure, giving a roadway width of thirty-nine feet, was completed in 1926, it was built with full provision for the widening that was foreseen, although perhaps the increase in traffic has been more rapid than anticipated.

The necessary curved alignment made the negotiation of the old bottleneck a hazardous undertaking. It was accordingly decided in 1934 to provide another full thirty-nine feet of driving surface with a center pier between the new and old roadways. But upon noticing that motorists had a tendency to veer away from the side walls, it was determined not to attempt to call for four lane traffic. Instead, stripes have been painted on the roadway providing a total of six wide lanes of about thirteen feet each, with one-way traffic on each group of three lanes.

LARGE PUMPS INSTALLED

The total cost including the provision of a superstructure carrying the tracks of the Southern Pacific Railroad was $203,000.

At the lowest part of the subway it was necessary to provide a pavement two feet six inches thick to resist the hydrostatic head of about eight feet. Adjacent pavement was secured against uplift by concrete dowels let into the rock foundation.

Pumps of large capacity were installed in a new pump house, so that a flood of any reasonable intensity can now be cared for adequately, and a complete system of lights has been supplied for pedestrian tunnels and roadway. In addition street lights have been placed on electroliers in the center curb at entrances, so that any hazard from faulty lighting has been removed.

This center curb is a unique safety feature. Recognizing the danger of any center support in an underpass of this sort, thought was given to methods of preventing the unwary motorist from wrecking his car on the center wall, with the result that a center curb four feet six inches wide was built up for nearly three hundred feet on either side of the structure. At the start of this curb, a specially illuminated sign warns motorists: "Keep to the Right." From here the curb is gradually increased to one foot in height, and surmounted by half a dozen 8-inch posts set in concrete and three electroliers.

SOUTH SAN FRANCISCO UNDERPASS as it appears today after a recent widening operation.

BEFORE WIDENING—Dotted lines show how additional space was provided for traffic and superstructure.

WIDENED TRAFFIC LANES separated by a curbing are shown in view of north side of underpass.

124 Inches of Snow Deposited at Norden in Fourteen Days

IN FEBRUARY a fairly heavy storm was general throughout the State from the 11th to 24th of the month. For the State as a whole, the monthly precipitation was more than double the forty year average, mostly falling within this storm period. The average snowfall for February throughout the State was 200 per cent of normal.

On the 11th there was 81 inches of snow on the ground at Norden, and at the end of the storm, on the 25th, there was 205 inches, which had settled to 184 inches by the end of February.

This storm resulted in fairly high or moderate flood stages in the Sacramento River and its tributaries. The situation in the Sacramento Valley was not serious, since the by-passes carried relatively little water, although all the project weirs were in operation. No real danger existed at any point within the completed portions of the Sacramento Flood Control Project. All parts of the project functioned perfectly.

SAN JOAQUIN AREAS DAMAGED

In the San Joaquin watershed there were quite heavy discharges in a number of the tributaries, including the Mokelumne, Calaveras, Stanislaus and a number of the smaller creeks, including those in the vicinity of Merced. Considerable damage was done in unprotected areas, and several leveed tracts were flooded, including the McCormack-Williamson and Dead Horse Island on the Mokelumne River, Reclamation districts Nos. 2063 and 2064 on the San Joaquin River, and the Franks, Medford, Rhodes and Quimby tracts in the delta.

The Sacramento weir gates were opened at 5 p.m. on February 22d, when the river at Sacramento was at 28.7 feet. The opening of the gates was followed by an immediate drop in stage, and by noon of February 23d it was reduced to 25.0 feet.

A complete estimate of the damage actually done by this storm and flood is not yet available, but it appears that the total will not be excessive. Practically all the damage occurred in unprotected and inadequately protected areas, and in the Yolo By-pass tidal reclamations, which are located on a by-pass dedicated to the passage of flood water and are farmed with the expectation of being inundated during floods.

Beetle Eradication Cost Reduced From $13.50 to $3 per Tree

(Continued from page 10)

However, the costs were reduced from $13.50 per tree by the hammer and chisel method to $3 a tree per year by the pipe injectors, with no mutilation of the tree. It is believed that one season's treatment will save trees not too badly infested.

Methods were changed in the seasonal treatment of 1935 and 1-inch holes were drilled on an angle of 45° from the vertical, through the bark and into the sap approximately one-half inch. The holes were filled with the "Black Leaf 40" solution and then corked tightly with $1\frac{1}{4}$-inch corks.

These holes were staggered around the circumference of the tree and additional holes drilled directly under each pitch tube or entrance. The corks prevent evaporation and prevent any pitch from exuding. This is a much faster and cheaper method and I believe more effective than the pipe injectors.

ONE-MAN EQUIPMENT

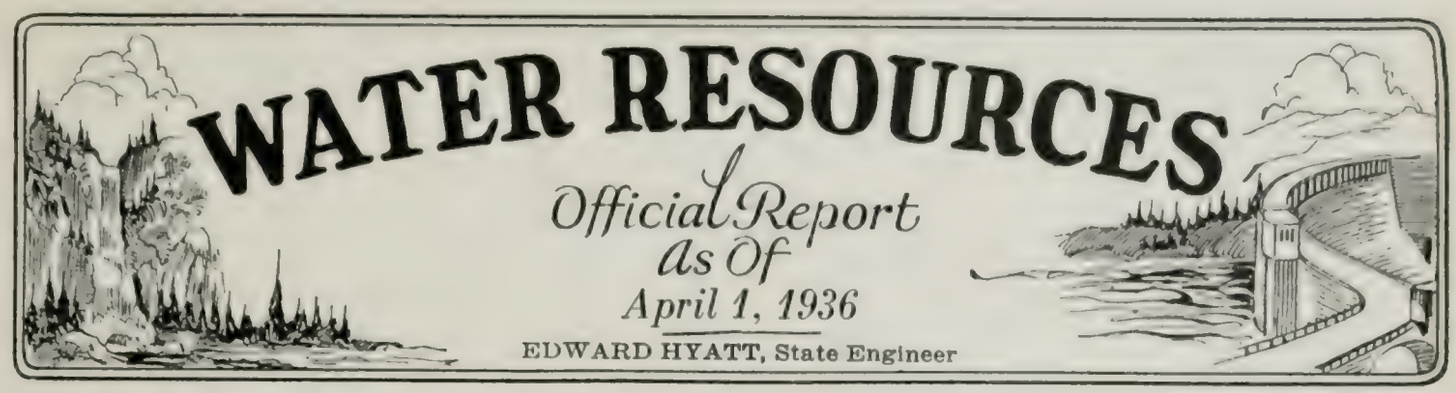
Equipment consists of a one-inch bit and brace, a bag of corks, a gallon can of solution and some red flagging to mark the trees, all of which may be carried by one man who walks over the section in order to give the trees closer inspection.

While digging into the trees to observe the effect of the treatment a curious thing has been observed. In several cases we found an adult beetle had entered the treated tree leaving a pitch tube entrance, had started an egg gallery, advanced possibly one-half inch or more and then bored out through the bark and evidently left the tree. My conclusion was that they did not like the taste of the nicotine in the inner bark and therefore moved out.

SUGGESTS INOCULATION

If this is the case the question arises, why not inoculate uninfested trees against attack from the beetle? Apparently a 10 per cent solution of "Black Leaf 40" is not harmful to the tree and if it is possible to save adult trees from three to six feet in diameter for say $3 per tree with the injection and cork method it would seem well worth while. The cost of removing these trees when dead and dangerous will average $20 per tree not considering the commercial and esthetic loss.

(Continued on page 32)



News of the Irrigation Districts, details of the operation of pumps and repair of bridges in the Sacramento Flood Control Project and applications for construction of numerous dams including one at Long Valley in Mono County are among the activities of the Water Resources Department described in the following monthly report of the State Engineer:

IRRIGATION DISTRICTS

A field investigation and report on work proposed by Naglee Burk Irrigation District was made at the request of the District Securities Commission. The district plans to trim by hand labor 8000 linear feet of canal and place 100,800 square feet of concrete lining on sections of the system where excessive seepage has occurred.

On reference from the Commission, an investigation and report was rendered on application of the recently formed Sutter Water District to issue bonds in the amount of $87,000 for construction of an irrigation system.

Compilation of statistical matter pertaining to the various irrigation districts in the State has been continued in the office for the purpose of issuing an annual report covering operations during the year 1935.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Routine maintenance work has been continued and the three drainage pumping plants east of the Sutter By-pass have been in operation for a large portion of this period. Repairs are now under way on several timber bridges in the Sutter by-pass which were damaged by the February flood. The three new plants being constructed by the California Debris Commission are approaching completion. The five new pumps in plant No. 3 were in operation during the recent rainstorm.

Relief Labor Work.

The relief workers available for the clearing projects in Sutter and Yuba counties have been gradually decreasing. On February 20th there were approximately 200 at work, on March 5th there were 194, on March 12th there were 163, and at this date there are about 150. No considerable time was lost on account of wet weather.

Sacramento Flood Control Project.

On March 19th a public hearing was held before the California Debris Commission in Sacramento in connection with a review of the reports on the Sacramento Flood Control Project, with a view to determining whether any modification of the plans in respect to maintenance is desirable at this time. This office assisted in the preparation of the material presented by the State at this meeting.

Application was filed on February 24, 1936, for the enlargement of Kent Dam Number 2, a small dam in San Mateo County near Pescadero. The reservoir is to be filled by pumping from adjacent streams and is to be used for irrigation. The estimated cost of the enlargement is $1,700.00.

Application was filed on February 20th by the California Water and Telephone Company for construction of the Judson Reservoir in San Diego County. The structure is to be a rolled earthfill 55 feet in height and storing 652 acre-feet of water for domestic and irrigation use. The estimated cost is $52,000.00.

Application was filed on March 16, 1936, for construction of the Long Lake Dam, a small rockfill at the outlet of Long Lake, at an estimated cost of $1,000. The structure will have a storage capacity of approximately 1500 acre-feet.

Application was filed on March 19, 1936, for construction of the Long Valley dam by the city of Los Angeles. This is to be a rockfill structure 117 feet in height and storing 163,000 acre-feet, located on the Owens River in Mono County and is estimated to cost $1,379,050.00.

Construction of the Cajalco Reservoir of the Metropolitan Water District is proceeding satisfactorily as is the work at San Gabriel Number 1 dam of the Los Angeles County Flood Control District.

Excavation for the enlargement of the O'Shaughnessy Dam has progressed throughout the winter and it is expected that pouring of concrete will be commenced shortly.

All of the dams of the Santa Clara Valley Water Conservation District, with the exception of Coyote Dam, have been completed. At the Coyote Dam some additional rockfill is yet to be placed as well as some of the spillway lining. The heavy rains during the past month filled some of these structures completely and an opportunity was had to observe them under load.

Construction has been resumed on the Arcata Dam in Humboldt County. Further exploratory work is under way at the Mad River Dam site of the city of Eureka.

The city of St. Helena has completed the rehabilitation of the St. Helena Lower Dam and the structure is again in operation.

In addition to the inspections of construction work under way, it has been possible to make many inspections of the structures already approved under conditions of maximum storage as a result of the recent heavy rains.

(Continued on page 28)

Two Mojave Projects Totaled $1,603,000

(Continued from page 27)

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

Office work during the past month has consisted of computing and compiling data with which to report the diversions, return flow, stream flow and acreage irrigated in the Sacramento-San Joaquin territory and the encroachment and recession of the salinity in the Delta during 1935.

The high water of February caused the recession of salinity in the Delta to a point where the water in Suisun Bay was practically fresh. This condition is being maintained and there is virtually no salinity above Bullshead Point.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the first part of the month activities were confined entirely to assemblying, correlating and tabulating the result of the snow surveys made at the end of February by the State and all cooperative agencies. These data were incorporated in the second monthly snow survey bulletin to be published this year, which was mailed to all interested parties on March 12th.

The balance of the month was occupied with compiling natural stream flow records for the past two years and preparing for the forecasts of runoff from the various basins of the State. The results of all snow surveys made at the end of March and early in April, together with the forecast of April-July runoff will be published in the next snow survey bulletin about April 12th.

WATER RIGHTS

Supervision of Appropriation of Water

Twenty applications to appropriate water were received during February; 11 were denied; 10 were allowed; 9 permits were revoked; 9 licenses were issued and 3 licenses were revoked.

Among the applications received were two to appropriate from Mojave River for projects of considerable size in San Bernardino County. One of these applications was by the Committee for the Mojave River County Water District, which was recently organized. This application proposes an appropriation of 400 cubic feet per second at a cost of $57,000 for an area of 20,000 acres. The other application was filed by Everett H. Swing to appropriate 300 second feet at a cost of $1,546,000 for an area of 15,000 acres.

Water Distribution.

Water master service for the 1936 season was commenced on the following named streams on March 19th: Owl, Soldier, Emerson, Cedar, Deep and Mill Creek Water Master Districts (In Surprise Valley, Modoc County).

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Progress was made during the month on field work in connection with the Kreyenhagen Hills Quadrangle in Fresno County; the San Bernardino No. 1 and No. 2 Quadrangles in San Bernardino County and cultural revision of the Hesperia, San Antonio, San Bernardino and Cucamonga Quadrangles in San Bernardino County. Office work was completed on the Cucamonga No. 4 Quadrangle in San Bernardino County and the Sebastopol Quadrangle in Sonoma County. Progress was made on the Paynes Creek Quadrangle in Tehama County and the Burney Creek Quadrangle in Shasta County.

The final sheets of the Chatom Ranch Quadrangle in Kings County and Lone Tree Well Quadrangle in Kern and Kings Counties are now available. These sheets were published on a scale of 1:31,680 with a contour interval of 5 feet.

The advance sheet of the Macdoel Quadrangle in Siskiyou County is now available. This is published on a scale of 1:96,000 with a contour interval of 50 feet and 100 feet.

WATER RESOURCES

South Coastal Basin Investigation.

Summary of the year's hydrological data was made but has not yet been published. Work continued along routine lines on the various phases of the South Coastal basin investigation.

Central Valley Project.

Progress is being made by the United States Bureau of Reclamation on the preparation of plans preparatory to starting construction on the initial units of the project.

Surveys are progressing at Kennett and Friant dam sites and along the proposed route of the Contra Costa Conduit, and appraisers have been placed in the field to evaluate the lands and right of way required on the construction of the project.

Exploration operations are under way at Friant and Kennett dam sites and The Division of Highways is making excellent progress in drilling the proposed site of the combination Highway-Railroad bridge on the Pit River.

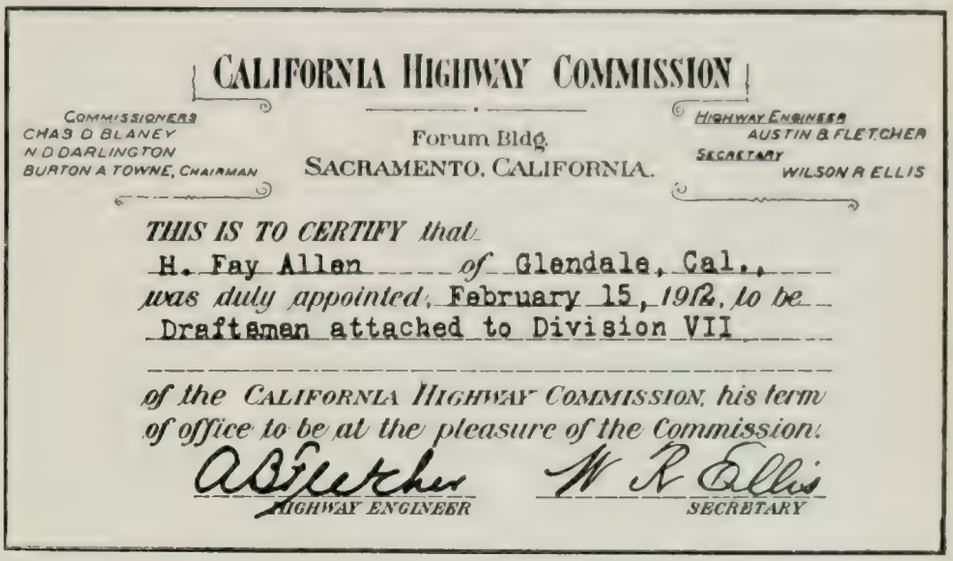
On mules we find two legs behind,
And two we find before.
We stand behind before we find
What those behind be for.

First Imbiber: "I found (hic) a half dollar."
Second Stew: "I'sh mine, it'sh got my name on it."
First Sot: Whats'h your name?"
Second Stiff: "E Pluribus Unum."
First: "Yeah, it'sh yours."

Old Timer, Do You Hold a Card to Beat This?

CONTENT to let others vie for the honor of being head man in the Old Timers' Club of the State Division of Highways, H. Fay Allen of Los Angeles is more interested in having an employee of District VII represented in the organization.

Wherefore, he sends in his application for membership in the club with the identification card given him by the old Highway Commission attesting to his appointment as draftsman in Division (now District) VII.



CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
H. Fay Allen of Glendale, Cal.,
was duly appointed, February 15, 1912, to be
Draftsman attached to Division VII
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A B Fletcher
HIGHWAY ENGINEER

W R Ellis
SECRETARY

H. F. Allen's card shows he has been at the job 24 years.

While he modestly refrains from mentioning the fact, Mr. Allen is a very close runner-up with C. M. Butts, District Construction Engineer of District X, Stockton, and George Mattis of Emeryville, one of the resident engineers of the San Francisco Bay Bridge, who are sharing the distinction of leadership in the club, both having been appointed to positions by the original Highway Commission on February 1, 1912. Mr. Allen's identification card is dated February 15, 1912.

(Continued on page 30)

HEADQUARTERS ENGINEERING PERSONNEL in 1914—No. 1—Franklin P. Borgnis, Chief Draftsman. 2—Clifford J. Temby, Engineering Draftsman. 3—Charles U. Fonteneau, Engineering Draftsman. 4—Lloyd A. Batham, Engineering Draftsman. 5—Clarence E. Bovey, Engineering Draftsman. 6—C. M. Saul, Engineering Draftsman. 7—A. B. Cleveland, Assistant Office Engineer. 8—Allen J. Wagner, Structural Draftsman. 9—John N. Bidwell, Engineering Draftsman. 10.—George R. Winslow, Assistant State Highway Engineer. 11—Ralph E. Dodge, Office Engineer. 12—Benjamin Bean, Engineering Draftsman.

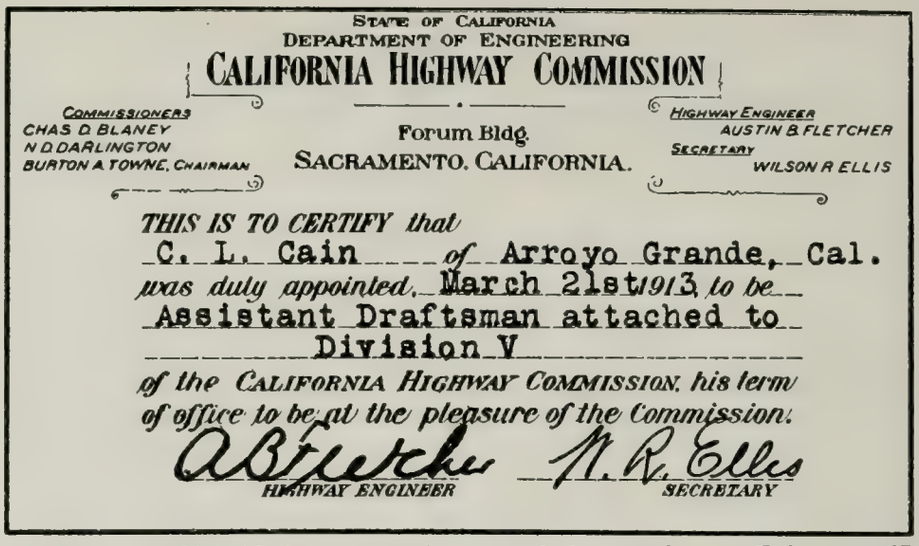
Personnel Roster of Headquarters in 1914 is Recalled

(Continued from page 29)

Mr. Allen also has an honor all his own. He has been continuously employed in District VII for more than 24 years.

In a letter accompanying his application for membership, Mr. Allen says:

"Referring to back numbers of the CALIFORNIA HIGHWAYS AND PUBLIC WORKS, I have been unable to find that any employee of District VII has applied for membership in the Old Timers' Club although I know several men who are eligible. Am enclosing my identification card given to me when I entered the State service in Division VII on February 15, 1912.



STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING
CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
C. L. Cain of Arroyo Grande, Cal.
was duly appointed, March 21st 1913 to be
Assistant Draftsman attached to
Division V
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A B Fletcher — HIGHWAY ENGINEER
W. R. Ellis — SECRETARY

C. L. CAINE (Caine correct) entered the service on February 15, 1912, although his card shows him appointed March 21, 1913.

TWENTY-FOUR YEARS SERVICE

"I have been in continuous service in this district for over 24 years. Unlike Mr. George Mattis of Emeryville, who says he 'feels just as old as if his service had been continuous' I do not feel anything like as old as my years, and nobody calls me the 'old man' yet —at least, not more than once."

C. J. Temby, District Office Engineer, District X, Stockton, applies for membership. He failed to send in an identification card, but forwarded an interesting photograph of the engineering personnel of headquarters of the Division of Highways taken in the drafting room of the California Highway Commission in Sacramento in 1914. Mr. Temby was appointed draftsman in the central office in August, 1914, after the Commission had ceased issuing cards. Mr. Temby writes:

ENGINEERING PERSONNEL GROUP

"Your articles in the CALIFORNIA HIGHWAYS AND PUBLIC WORKS relative to 'old timers' are very interesting and I would like to submit a little contribution toward 'old timers' history.

"The attached photograph was taken in 1914 in the drafting room of what then was headquarters of the California Highway Commission on the fifth floor of the Forum Building in Sacramento. The picture is of the entire engineering personnel of headquarters as of that date, with the exceptions of Structural Draftsman Johnson and George D. Whittle, who took the photograph. Incidentally, this personnel also handled all bridge work then performed by the Division of Highways at headquarters.

"The titles of the men at the time the photograph was taken were: George R. Winslow, Assistant State Highway Engineer; Ralph E. Dodge, Office Engineer; A. B. Cleveland, Assistant Office Engineer; Franklin P. Borgnis, Chief Draftsman; Allen J. Wagner, Structural Draftsman, and Benjamin Bean, Lloyd A. Batham, Clarence E. Bovey, Charles Fonteneau, C. M. Saul, John N. Bidwell and Clifford J. Temby, all Engineering Draftsmen.

"As far as I know at this time, the whereabouts of these men are as follows: Winslow, Assistant Construction Engineer, Central Office; Dodge, deceased; Cleveland, Automobile Club of Southern California; Borgnis, in private practice; Wagner, with U. S. Government, San Francisco; Bovey, District Maintenance Engineer, District X, Stockton; Temby, District Office Engineer, District X; Fonteneau, Engineering Draftsman, District X; Batham, Chief Draftsman, District IV, San Francisco; Bidwell, Resident Engineer, District IX, Bishop; Whittle, Bridge Engineer, U. S. Bureau of Public Roads, San Francisco; Saul and Bean, whereabouts unknown to me."

A new member of the Old Timers' Club is C. L. Caine of Barstow. Mr. Caine entered the service of the Division of Highways on February 15, 1912, as axman and on March 21, 1913, was appointed assistant draftsman of Division V. The identification card he sends in with his application for membership bears this date. Mr. Caine now is maintenance superintendent with headquarters at Yermo, San Bernardino County.

Highway Bids and Awards

for March, 1936

ALAMEDA COUNTY—Between Laguna Creek and Dublin, about 3.8 miles in length, crusher run base to be constructed and armor coat to be applied thereto, District IV, route 107, Section B. Pacific Truck Service, Inc., San Jose, $22,419; J. A. Casson, Hayward, $22,467; Geo. French, Jr., Stockton, $19,841; Palo Alto Road Materials Co., Ltd., Palo Alto, $22,097; N. M. Ball Sons, Berkeley, $24,542; A. J. Raisch Co., San Jose, $24,712; A. Teichert & Son, Inc., Sacramento, $23,424; E. A. Forde, San Anselmo, $24,297; Chas. L. Harney, San Francisco, $23,672; Heafey-Moore Co., Oakland, $23,800; Independent Const. Co., Ltd., Oakland, $22,898. Contract awarded to Claude C. Wood, Stockton, $19,302.25.

CONTRA COSTA COUNTY—Between Antioch and Borden Highway, 16.6 miles cr. run base shldrs. with seal coat. District IV, Route 75, Section C.D. Palo Alto Roads Material Co., Ltd., Palo Alto, $38,741; A. Teichert & Son, Inc., Sacramento, $37,653; L. C. Seidel, Sacramento, $37,865; W. H. Larson, Oakland, $38,941; Geo. French, Jr., Stockton, $39,905; Hanrahan Company, San Francisco, $34,784. Contract awarded to Fredericksen & Westbrook, Lower Lake, $33,426.

HUMBOLDT COUNTY—In Eureka, between Sly. city limits and Wabash Avenue, about 1.5 miles to be graded and surfaced with bit. tr. cr. grav. or stone. District I, Route 1, Section G, Eur. Hemstreet & Bell, Marysville, $71,499. Contract awarded to Mercer, Fraser Company, Eureka, $69,338.95.

IMPERIAL COUNTY—On Calipatria Imperial Road, between New River and 2 miles west of Calipatria. About 20.6 miles to be graded and br's. to be constructed. District XI, Route Calipatria-Imperial Feeder. R. E. Hazard & Son, San Diego, $212,810; C. W. Caletti & Co., San Rafael, $244,182; Oswald Bros., Los Angeles, $218,907; J. E. Haddock, Ltd., Pasadena, $242,666. Contract awarded to V. R. Dennis Const. Co., San Diego, $209,844.

INYO COUNTY—Between 8 miles south of Keeler and Centennial wash, 1.8 miles to be graded. District IX, Route 127, Section D. Basich Bros., Torrance, $22,193; A. S. Vinnell Co., Los Angeles, $19,395. Contract awarded to Young & Son Co., Ltd., Berkeley.

KERN COUNTY—Between Eric and La Rose, 4.9 miles to be graded road-mix surf. trt. applied, and a timber bridge constructed. District VI, Route 58, Section G. J. E. Haddock, Ltd., Pasadena, $106,634; R. R. Carlson, Stockton, $102,688; Oswald Bros., Los Angeles, $105,491; David H. Ryan, San Diego, $96,009; Guy F. Atkinson Co., San Francisco, $98,917; Young & Son Co., Ltd., Berkeley, $87,699; A. S. Vinnell Co., Los Angeles, $90,670; Gibbons & Reed Co., Burbank, $109,958; Griffith Co., Los Angeles, $136,748; Granfield, Farrar & Carlin, San Francisco, $88,142; M. J. B. Const. Co., Stockton, $94,312; C. W. Caletti & Co., San Rafael, $94,597. Contract awarded to A. Teichert & Son, Inc., Sacramento, $86,146.80.

MADERA COUNTY—Between Kelshaw Corners and Coarse Gold, 8.0 miles, grade and oil. District VI, Route 125, Section C. Dale Hinman, Denver, Colo., $244,166; Gibbons & Reed Co., Burbank, $279,644; Mittry Brothers Construction Co., Los Angeles, $307,135; A. Teichert & Son, Sacramento, $325,941; Isbell Construction Company, Reno, Nevada, $279,175. Contract awarded to C. W. Caletti & Co., San Rafael, $226,015.20.

MARIN COUNTY—Between Route 1 and Point San Quentin, 2.4 miles cr. run surf. and armor coat. District IV, Route 69, Sections A, S.Rf. Pacific States Construction Co., San Francisco, $24,331; A. G. Raisch. San Francisco, $24,828. Contract awarded to E. A. Ford, San Anselmo, $21,994.

MONTEREY COUNTY—Between Lewis Creek and Priest Valley, about 1.1 miles in length, to be graded, surfaced with selected material, and treated with liquid asphalt. District V, Route 10, Section C. R. R. Carlson, Stockton, $27,812; J. L. Conner, Monterey, $23,095; Leo F. Plazzo, San Jose, $33,377; M. J. B. Construction Co., Stockton, $25,201; L. A. Brisco, Arroyo Grande, $26,329; William C. Horn Company, Pomona, $29,978; Granfield Farrar & Carlin, San Francisco, $25,301; A. Teichert & Son, Inc., Sacramento, $27,174; Poulos & McEwen, Sacramento, $25,088; C. W. Caletti & Co., San Rafael, $28,853. Contract awarded to Young & Son, Ltd., Berkeley, $20,915.60.

MONTEREY COUNTY—Between Soledad and Gonzales, 8.3 miles grade and plant-mixed surface. District V, Route 2, Section D, C. Heafey-Moore Co., Oakland, $146,745; Peninsula Paving Company, San Francisco, $147,542; A. Teichert & Son, Inc., Sacramento, $154,376; Union Paving Co., San Francisco, $139,481. Contract awarded to A. J. Raisch Co., San Jose, California, $134,348.35.

NAPA COUNTY—Between Napa city limits and Napa Wye, 2.6 miles, surf. with cr. run base and plant-mixed surf. District IV, Route 8, Section B. Hanrahan Co., San Francisco, $42,166; E. A. Forde, San Anselmo, $41,444; L. C. Seidel, Sacramento, $44,737; Pacific States Const. Co., San Francisco, $42,840. Contract awarded to A. G. Raisch, San Francisco, $38,374.50.

SAN BERNARDINO COUNTY—Between Ontario and Riverside, about 14.4 miles in length, shoulders to be graded and treated with liquid asphalt. District VIII, Route 19, Sec. B & A. P. J. Akmadzich, Los Angeles, $25,195; Dimmitt & Taylor, Los Angeles, $28,174; A. S. Vinnell Co., Los Angeles, $23,042; Geo. Herz & Co., San Bernardino $22,955; Oil Fields Trucking Co., Bakersfield, $27,519; Matich Bros., Elsinore, $21,412; Basich Bros., Torrance, $28,580; Oswald Bros., Los Angeles, $26,659. Contract awarded to C. W. Wood, Stockton, $20,308.

SAN DIEGO COUNTY—Diesel oil to be applied to roadside vegetation for a distance of about 85 roadside miles. At various locations in District XI. Consumers Oil Co., Los Angeles, $1,367; Gilmore Oil Co., Los Angeles, $1,666; Paulsen & March, Inc., Los Angeles, $1,808; R. E. Hazard & Sons, San Diego, $1,536. Contract awarded to Square Oil Co., Los Angeles, $1,045.25.

VENTURA COUNTY—Between Oxnard and Hueneme Road, about 4.9 miles wide ex. rd. bd. and place P. C. C. wide strip. District VII, Route 60, Section A. Basich Bros., Torrance, $75,234; Sander, Pearson & Mundo Eng. Co., Los Angeles, $75,558; Geo. R. Curtis Paving Co., Los Angeles, $77,820; Matich Bros., Elsinore, $69,984; Oswald Bros., Los Angeles, $69,086. Contract awarded to J. E. Haddock, Ltd., Pasadena, $67,523.05.

VENTURA COUNTY—Between E. Casitas Pass and Coyote Creek. About 2.8 miles to be graded and a road mix surface treatment applied. District VII, Route 151, Section B, C. Mittry Bros. Const. Co., Los Angeles, $89,518; M. J. B. Const. Co., Stockton, $80,793; David H. Ryan, San Diego, $89,774; Granfield Farrar & Carlin, San Francisco, $79,083; C. G. Willis & Sons & Chas. G. Willis, Los Angeles, $78,260; A. S. Vinnell Co., Los Angeles, $91,265; Daley Corp., San Diego, $69,378; Sharp & Fellows Cont. Co., Los Angeles, $80,396; Sander Pearson & Mundo Engineering Co., Los Angeles, $88,696; Oswald Bros., Los Angeles, $84,054; Matich Bros., Elsinore, $82,842. Contract awarded to C. F. Robbins, Los Angeles, $65,321.50.

YOLO-SACRAMENTO COUNTIES—Between M Street Subway and Sacramento River Bridge (Yol-8-C), and between Ben Ali Subway and Ben Ali Station (Sac-3-B), about 1.2 miles highway roadsides to be landscaped. District III, Route 6-3, Section C-B. Leonard Coates Nurs., Inc., San Jose, $6,022; California Nursery Co., Niles, $8,927.56. Contract awarded to Rexroth & Rexroth, Bakersfield, $7,948.08.

Teacher: "Percy, why are you crying?"

Percy: "Jimmy kicked me in the stomach."

Teacher: "Jimmy, did you mean to kick Percy in the stomach?"

Jimmy: "Naw, he turned around just when I kicked."

Kit: "Gee, but that date last night was fresh."

Kat: "Why didn't you slap his face?"

Kate: "I did; and take my advice, never slap a guy when he's chewing tobacco."—*Exchange.*

Ground Broken for Bridge on Proposed Lodi-Rio Vista Road

(Continued from page 20)

Rio Vista with a drawbridge over the North Fork of the Mokelumne River and a slough crossing on Brannan Island.

From Terminous to the state highway, Route 4 (Cherokee Lane) near Lodi, an existing narrow county road with 18-foot pavement will be widened and utilized, according to tentative plans.

PROVIDES EXPORT OUTLET

Completion of the new road will offer many advantages to the delta agricultural area as it will provide an outlet for the transportation of agricultural products by truck direct from ranches to the port of Stockton for transshipment by water to eastern and foreign points.

The distance between Rio Vista and Stockton, via the present state and county roads, is 43.6 miles. The proposed cut-off will diminish this distance to about 30.9 miles, or a saving of approximately 12.7 miles. A possible revision of the county road alignment south of the Terminous road may effect an additional saving of 2 miles, making the total distance saving between Rio Vista and Stockton by the projected short cut about 14.7 miles.

The new road also will serve as an important link between the Redwood Empire, the San Francisco-Oakland bay region and San Joaquin Valley, and also the scenic areas of the Sierra.

HIGH TRAFFIC COUNT

Plans for the new highway call for a graded roadbed 36 feet wide and surfaced 20 feet wide. Construction of the bridge across Potato Slough and its approaches was provided for in the Federal Works Program at an estimated cost of $175,000.

Approximately 1700 vehicles use the existing road daily and this volume of traffic is expected to materially increase following completion of the new project.

In 1921 the legislature adopted the present road between Rio Vista and a connection with State Highway Route 4 near Lodi as a state highway, which, from Fairfield in Solano County to Lodi via Rio Vista, Isleton, Walnut Grove and Thornton, is designated Route 53.

State Highway Trees Saved From Attack of Pine Beetle Pest

(Continued from page 26)

For inoculation, holes should be bored on 12-inch centers on the circumference near the ground. Then another series four feet higher on the tree. This will, theoretically, take care of eight feet of the trunk which is sufficient for an uninfested tree. Injections should start in March and April and continue until June. Once a week should be sufficient, a 5-foot diameter tree taking approximately two to three pints a treatment. Two gallons should inoculate a tree, the 10 per cent solution costing about $1 per gallon made up.

ONE TREATMENT IMMUNIZES

It is believed that one season will place enough nicotine in the inner bark to immunize a tree at a cost of $3. Should the tree show signs of beetle activity in succeeding years treatments could be given at one-half the initial cost.

In conclusion the following points are brought out:

1. A 10 per cent solution of "Black Leaf 40" (equivalent of 4 per cent solution pure nicotine sulphate) is not injurious to adult yellow pine.
2. Western pine beetle have been identified as working in the trees under treatment.
3. Groups of dead adults have been found in the trees under treatment and identified as Western pine beetle.
4. Trees under treatment showed yellow and brown foliage at the start and no additional dead foliage since.
5. Cf the 20 trees under treatment none have died.

For inoculation of uninfested trees the borings and cork method would be necessary, but for infested trees I have in mind a pressure gun that will inject fluid directly into the pitch tubes and force the solution through the egg galleries. Sheep dip or fly spray would be used which would not only kill the adult beetles but larvae and eggs at the same time.

This method will be tried the season of 1936 provided a pressure gun can be devised and I am confident will give quicker and more effective results at far less cost.

The 1933 legislature authorized the Department of Public Works to make any changes deemed necessary in the existing route between Rio Vista and Lodi or to vacate the whole or any portion of it for a new route.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
CHARLES D. HAMILTON, Banning
C. H. PURCELL, State Highway Engineer, Sacramento
JULIEN D. ROUSSEL, Secretary

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST (Acting), Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
JNO. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego
General Headquarters, Public Works Building, Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
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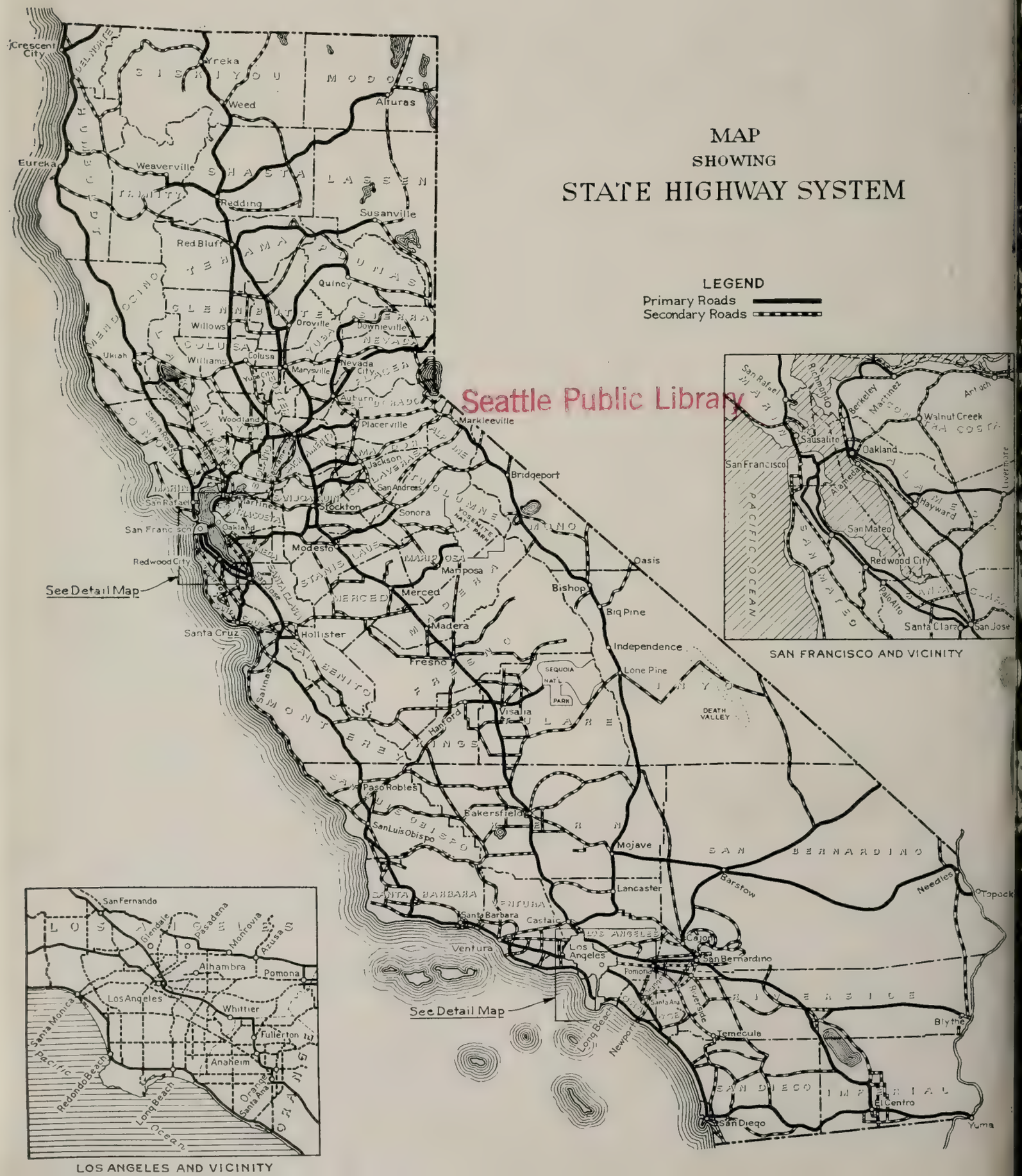

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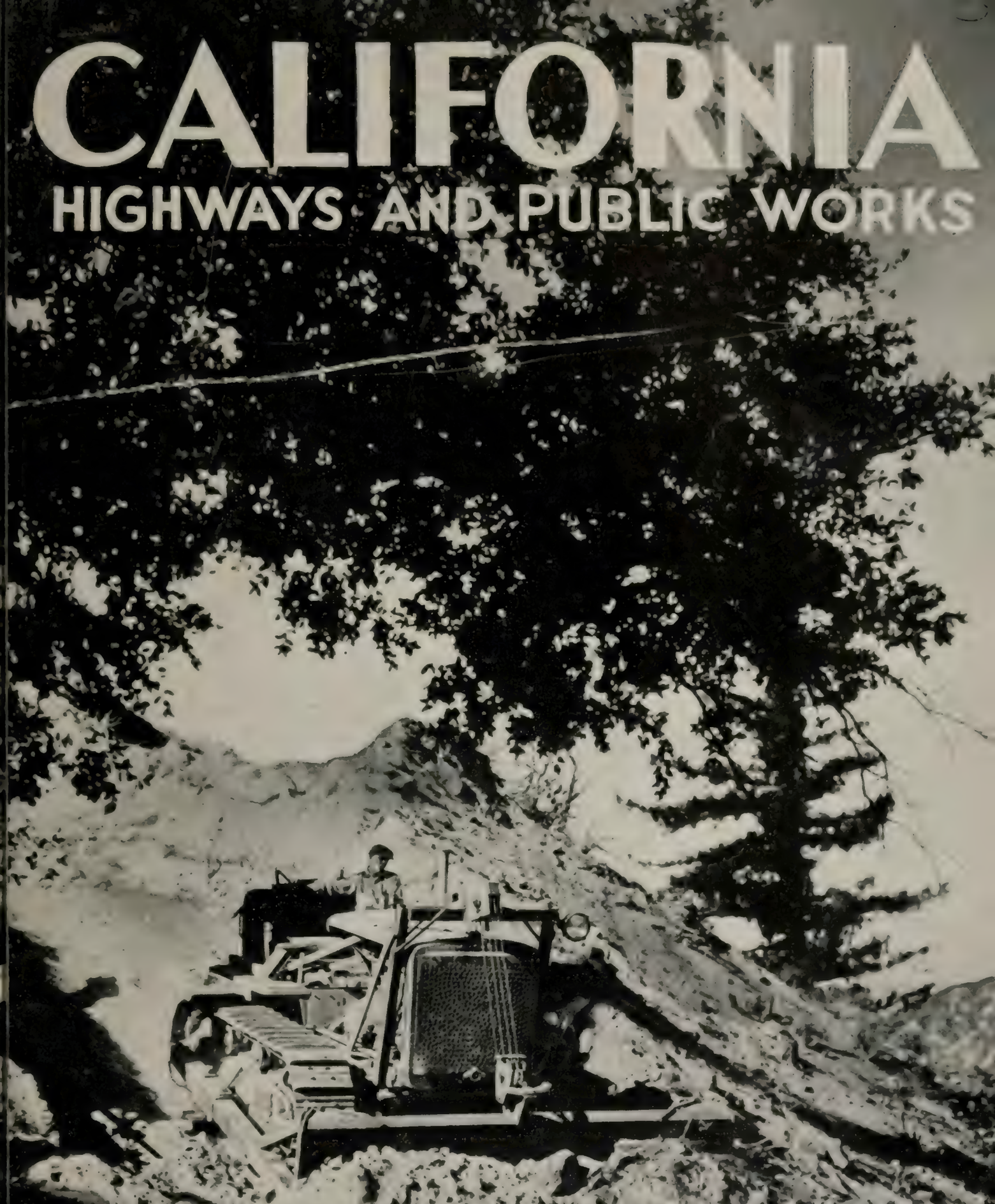

Grading the Angeles Crest Highway in San Gabriel Mountains

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MAY •• 1936

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Western Highway Officials

in Annual Convention Are Told Highway

Development Is at Crossroads

Resolutions Oppose Gas Tax Diversion

By **HARRY A. HOPKINS,** Chairman, California Highway Commission

THE fifteenth annual meeting of the Western Association of State Highway Officials met at Phoenix, Arizona, April 29 and 30, 1936. All the twelve western states were represented. While Texas does not have any Federal public lands, it joined the association because its problems in highway construction are similar to those of the public land states.

Excellent addresses featured the sessions, including talks by Dr. L. I. Hewes, Deputy Chief Engineer, U. S. Bureau of Public Roads, San Francisco; R. E. Toms, Chief, Division of Design, Bureau of Public Roads, Washington, D. C., and Gibb Gilchrist, president of the American Association of State Highway Officials and State Highway Engineer of Texas.

HARRY A. HOPKINS

An outstanding address that was received with the greatest interest was given by Col. Willard Chevalier, president of the American Road Builders Association and vice president of the McGraw-Hill Publishing Company in charge of civil engineering and mining publications, who spoke on the subject "Highway Development at the Crossroads." In appreciation of his interest in highway matters and his contribution to the meeting, the Western Association of State Highway Officials presented him with a certificate of life membership.

Reviewing highway development from 1900 when only 8000 motor vehicles were on the roads in this country to 1936 when 26,000,000 are in use, Col. Chevalier traced the history of highway development through these stages of progress: (1) the good roads era, when the big problem was to build roads, with "no time for anything except to get a negotiable mileage of some kind of a surface capable of supporting the auto"; (2) the period when the Federal government became interested in highway development, giving a "tremendous impetus to sound, technical improvement"; (3) the development of highway design and construction into a definite science, and (4) the establishment of the gas tax principle for highway financing.

Colonel Chevalier sketched in detail the situation existing during the past few years when highway construction has been taken out of the field of recognized engineering procedure and transformed into an agency devoted to unemployment relief and made-work.

(Continued on page 14)

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Twenty Grade Separation Projects Being Built in Southern California

By **STEWART MITCHELL**, Bridge Construction Engineer

TWENTY railroad grade separation projects are under construction in southern California financed through funds provided by the Federal Emergency Relief Act of 1935 supplemented by highway gas tax funds.

Nine of these projects are important railroad grade crossing separations in the Los Angeles metropolitan area. This area, noted for its traffic density, is a prolific field for worth while projects of this kind, but it also presents many difficulties on account of excessive right of way and property damage costs which naturally arise in all locations where the population is relatively dense and the traffic is heavy.

These nine grade separations are all located where main line railroad tracks are crossed by heavy traffic arteries and where the removal of hazard and delay to traffic has long been desired by the railroads concerned, as well as the Los Angeles Planning Commission and other traffic bodies.

FIGUEROA STREET VIADUCT

The most costly of these projects is the construction of a viaduct on the extension of Figueroa Street, just north of the three tunnels under Elysian Park, which were recently built by the city of Los Angeles. At this point, the proposed boulevard must cross the Los Angeles River, which is paralleled on each side by railroad tracks of the Southern Pacific Company.

In order to provide a crossing of the river and railroad tracks, as well as the heavily traveled San Fernando Boulevard north of them, a concrete and steel structure somewhat over 800 feet long and carrying 4 lanes of traffic is being built on a high speed alignment. The width of the roadway between curbs is 44 feet, and there is a 7-foot sidewalk on each side of it.

The plans for this structure were prepared jointly by the Division of Highways and the city of Los Angeles, the architecture being in keeping with the monumental structures that have been built by the city over the Los Angeles River.

A difficult problem in the design and construction of the viaduct arises from the fact that, in order to provide the length of span over the river which the Los Angeles Flood Control Commission desired, it was necessary to place the piers very close to the railroad tracks and over, or around, important city sewer lines.

Two other large grade separation projects in Los Angeles City will eliminate two very heavily traveled grade crossings on the Pacific Electric Railway, one of which will carry Mission Road under the 4-track Pasadena line over which 560 trains pass a day. At this location Mission Road joins the double roadway of Huntington Drive and is intersected a short distance beyond by Soto Street, a through artery leading to the south, thus forming a complicated and hazardous traffic situation.

To construct this separation without becoming involved in the relocation of the existing streets and having to face large right of way costs and property damage, the railroad tracks are being raised in their present location. This requires that the structure over Mission Road, with its long earth approach fills retained by concrete walls, must be built under this heavy train traffic.

THREE TRAFFIC STREAMS

Traffic from Mission Road to the southerly roadway of Huntington Drive carries the major portion of the traffic at this location and will be taken care of by two openings each 32 feet in width. In addition, two other openings of similar width will serve traffic traveling between Mission Road and Soto Street and between the two roadways of Huntington Drive.

The other separation of the highway and the Pacific Electric Railway is on the Long Beach line and is located on Firestone Boulevard in the town of Graham. At this crossing the railroad traffic is practically as heavy as at Mission Road and consists of 472 passenger and 18 freight trains a day. It is necessary to follow the same procedure here as at Mission Road and construct this separation by raising the railway tracks, except that it was possible to by-pass the trains during con-

(Continued on page 20)

GRADE SEPARATIONS UNDER CONSTRUCTION—At top crossing on State Highway Route No. 19, (Jack Rabbit Trail) near Beaumont showing narrow existing overhead and new structure construction over railroad. Center—Present "s" curve crossing near Indio and new highway overhead structure under way. At bottom—Firestone Boulevard overpass being built in Los Angeles where 490 Pacific Electric trains will daily cross above highway.

Governor Merriam Breaks Ground for Marin Approach to Golden Gate Bridge

FIVE thousand persons gathered on a green knoll at Waldo Point on Sunday afternoon, May 10th, saw Governor Frank F. Merriam pull the throttle of a huge steam shovel that made the first excavation for the Waldo approach highway to the $35,000,000 Golden Gate Bridge.

The Governor's act climaxed colorful ground-breaking ceremonies participated in by high Federal and State officials, representatives of the United States Army, representatives of county governments of the San Francisco Bay area and the Redwood Empire and officers of the Golden Gate Bridge and Highway District and Marvelous Marin, Inc.

Director Earl Lee Kelly headed a delegation of officials from the State Department of Public Works and its agency, the Division of Highways, under whose supervision the State Highway approach to the Marin County terminus of the bridge will be constructed.

PICTURESQUE PAGEANT HELD

A luncheon at Fairfax, a program of speech making and a picturesque pageant depicting various eras of travel in California preceded the actual breaking of ground. Music was furnished by the Marvelous Marin Band.

George A. Corwin was general chairman and introduced H. G. Ridgway, of the Redwood Empire Association, who acted as master of ceremonies. The speakers reviewed all phases of the years of work that made possible the Golden Gate Bridge and led up to the start of the Marin approach, final highway link between the north coast counties and the huge structure spanning the Golden Gate.

Greetings from Mayor Angelo J. Rossi of San Francisco were extended by his secretary, Eneas Kane, and congratulatory remarks made for the Army by Major Charles D. Ostrom, Ninth Corps Area; for the U. S. Bureau of Public Roads by District Engineer C. H. Sweetzer; for the U. S. Forest Service by B. B. Burnett, Forest Highway Engineer.

JOINT HOSTS REPRESENTED

As joint hosts of the occasion with the Redwood Empire Association, Marvelous Marin, Inc., welcomed the guests through its president, Harry N. Christensen.

Brief talks were made by Harry A. Hopkins, chairman of the California Highway Commission; Paul Jasper of Fortuna and Ray Judah of Santa Cruz, newly appointed members of the commission, and Timothy A. Reardon of San Francisco, retiring commissioner; Robert A. Trumbull, vice president of the Golden Gate Bridge and Highway District, and others.

Director of Public Works Kelly expressed his pleasure at being a participant in the ground breaking which signalized the start of construction on the Marin approach over which millions of motorists in the future will travel to and from the Golden Gate Bridge.

Governor Merriam followed Director Kelly, being introduced by George P. Anderson, president of the Redwood Empire Association.

GOVERNOR MERRIAM SPEAKS

"This Marin approach project," the Governor said, "is the most costly and one of the most important units of construction ever undertaken by the Division of Highways. Its completion will not only mean much to the great Redwood Empire area, but to the State of California as well. As a means of creating employment it will help materially in restoring economic normalcy in our State.

"With the Golden Gate Bridge it will serve to open up more widely the great empire to the north and bring our north coast counties closer to the great metropolitan centers of California. Because of all that it means to the development of California, I am glad that today I have a small part in the building of the Marin approach."

The ceremonies were concluded with the Marvelous Marin pageant under the direction of Al Walker and renditions by the band.

Participating in the ground breaking as representatives of the Department of Public Works were Edward J. Neron, Deputy Director of Public Works; C. H. Purcell, State Highway Engineer; Col. John H. Skeggs, District Engineer; Fred J. Grumm, Engineer, Surveys and Plans; C. S. Pope, Construction Engineer, and T. E. Stanton, Materials and Research Engineer, all of the Division of Highways.

GOVERNOR MERRIAM OFFICIATING AT GROUNDBREAKING CEREMONIES OF MARIN APPROACH TO GOLDEN GATE BRIDGE

At the throttle of a big steam shovel, California's Chief Magistrate turns the first earth on the largest excavation job for a 3.7 mile highway project in the annals of the Department of Public Works.

EPOCHAL EVENT IS CELEBRATED WITH FETE AND SPEECHMAKING IN A BEAUTIFUL ARBOREAL SETTING

Governor Merriam at the microphone tells a large gathering of officials and citizens what this great bridge and highway traffic improvement means to the future prosperity of San Francisco, the Redwood Empire and the State.

Marin Approach to Golden Gate Bridge Involves Tunnel and Record Grading Job

By **JNO. H. SKEGGS,** District Engineer

IN RECENT years no phase of highway design has received more study than the construction of the radiating arterials over which traffic is concentrated and distributed in metropolitan areas. Of the larger of such districts, the San Francisco area has presented one of the most difficult problems.

For three-quarters of a century the City of San Francisco, situated on the southern peninsula between the bay and the Pacific, has been forced to depend upon shuttling ferries for contact with the terminals of eastern transportation in Oakland and Berkeley across the bay, and with the southern terminus of the Redwood Highway, which extends along the California Coast to its southern terminus at Sausalito on the northern side of the Golden Gate.

The pressure of rapidly increasing traffic and steady growth in population has compelled the construction of two of the world's greatest engineering achievements: the San Francisco-Oakland Bay Bridge, connecting the metropolis with the East Bay area, and the Golden Gate Bridge, spanning the world famous harbor entrance.

IMPORTANT LINK CONNECTION

An important unit in the development of adequate traffic facilities to the north is the three and one-half mile section of State highway now under construction that will serve as a connection between the north end of the Golden Gate Bridge and the Redwood Highway.

The Redwood Highway is an arterial of major importance in the California State highway system officially designated as State Route No. 1 and U. S. 101. It not only serves as a commercial outlet for the fertile agricultural areas in the valleys of Marin, Sonoma, and Mendocino counties, but leads into the heart of the great Redwood Empire of the northern California coast country in Mendocino, Humboldt, and Del Norte counties.

Construction of this route to modern standards of alignment, grade, and width of surfacing has been one of the foremost items in the general program of the Division of Highways with the result that the entire route has now reached a high standard, especially the southern portion on the 100 miles between Sausalito and Hopland. With the construction of the Golden Gate Bridge, a marked increase in travel to the north coast country must be anticipated.

SKETCH OF STATE HIGHWAY Marin approach route showing location of tunnel through Sausalito Hills.

TUNNEL THROUGH RIDGE

To meet the demands of this anticipated traffic over the bridge the Division of Highways has located a new link from the existing highway at Madrona street, near Waldo Point northerly of Sausalito. This new route passes along the rugged hillsides rising behind the city of Sausalito with a 1000-foot tunnel designed to carry it through the long ridge at the southerly limits of the city and

(Continued on page 26)

MARIN APPROACH alignment to Golden Gate Bridge through rugged Sausalito hills is shown by dotted lines. At top—Location of tunnel through high ridge. Center—General view of route from Bolinas Street. At bottom—Alignment from present State Highway at Waldo Point and Richardson Bay.

H. R. Judah of Santa Cruz Becomes Member of State Highway Commission

H. R. JUDAH, newspaper publisher and a leading citizen of Santa Cruz, has been appointed a member of the California Highway Commission to fill the vacancy created by the resignation of Commissioner Timothy A. Reardon.

Although exceedingly active in public affairs in Santa Cruz, for many years, Mr. Judah's main inclination and efforts have been directed toward highway matters in the central coast section of the State and as a member of civic delegations he has made frequent appearances before the highway commission in behalf of many proposed highway improvements.

In accepting his appointment Mr. Judah said: "I appreciate the great honor that Governor Merriam has conferred upon me and the opportunity he has given me to serve with men who have so ably carried on the development of our highway system. In this connection I want to state that I am unalterably opposed to any diversion of the gas tax funds for any purpose other than for the use of construction and maintenance activities on California highways.

H. R. JUDAH

OPPOSED TO DIVERSION

"I am hopeful that members of the State Legislature at the forthcoming session will turn a deaf ear to any organized groups in this State requesting diversion of gas tax moneys of the State in any other direction away from the uses for which gasoline taxes are gladly paid—the building of highways."

H. R. Judah was educated in the old St. Matthews Military School in San Mateo, graduated from there in 1900 and entered the University of California, where he spent two years. Immediately after that he went into the home office of the Northern Commercial Company, then the controlling interest of all commercial business done on the Yukon River in Alaska.

In 1905, he entered the advertising business with his brother, F. S. Judah. They purchased the old business of Peck and Garrett and formed the Peck-Judah Company, and H. R. Judah became the manager of the southern branch with headquarters in Los Angeles. The company had at that time only the two informative and advertising bureaus, one in San Francisco and the other in Los Angeles.

Following the San Francisco earthquake of 1906, he returned to Santa Cruz where he had formerly resided and resumed his old position as manager of the Chamber of Commerce.

In 1907 he became acquainted with E. J. Devlin, then managing editor of the *Sacramento Bee,* and on November 1 of that year they formed a partnership and started the Santa Cruz *Evening News* as a daily newspaper and they have been operating that business together ever since that date on the same spot at 29 Walnut Avenue, Santa Cruz.

He has played a prominent part in newspaper organization work in California particularly in the formation of the California Newspaper Publishers Association.

Paul G. Jasper, Publisher of Humboldt County, Named Highway Commissioner

NEWSPAPER publisher, good roads advocate, veteran of the World War and active participant in the civic affairs of his community, Paul G. Jasper of Fortuna, Humboldt County, has been appointed by Governor Frank F. Merriam to succeed Ray Ingels, resigned, as a member of the California Highway Commission.

The vacancy on the commission which Mr. Jasper fills has existed since Mr. Ingels was made Director of the Department of Motor Vehicles by Governor Merriam. Mr. Ingels hails from Mendocino, neighboring county of Humboldt.

The new member of the Highway Commission is owner and editor of the Humboldt Beacon, a newspaper published in Fortuna. He has been prominently associated with the California Newspaper Publishers Association and the California Press Association for years.

KNOWS HIGHWAY NEEDS

For the past ten years he has also been a member of the Republican State central committee and is a member of the Republican county central committee of Humboldt.

Mr. Jasper has not confined his activities in public matters to his home county. He has traveled extensively throughout California and being intensely interested in everything pertaining to highways he is familiar with highway needs in many sections of the State. His business letterheads bear a picture of a highway scene.

Born in Santa Rosa on April 27, 1891, Mr. Jasper moved to Fortuna when a boy and has resided there for 33 years, except for a year in newspaper work in San Francisco and a period of 18 months during the World War, when he served as a sergeant in the U. S. Army. He is married and has two children, a daughter, Ardis, 16 years old, and a son, Richard, age 12 years.

ACTIVE IN VETERANS' AFFAIRS

The new Highway Commissioner has taken an active part in affairs of the American Legion and is a charter member and past commander of Walker Bailey Post, as well as an honorary member of the Veterans of Foreign Wars.

PAUL G. JASPER

Equally active in civic affairs Mr. Jasper is a past president and secretary of the Fortuna Rotary Club, of which he is also a charter member, and has attended numerous district and international conventions of the Rotarians.

In his capacity of newspaper publisher, Mr. Jasper long has been an advocate of the extension and high standard construction of California's State Highway system.

"Don't you think, Doctor, that you overcharged when Jimmie had the measles?"

"You must remember, Mrs. Brown, that includes twenty-two visits."

"Yes, but you remember, he infected the whole school."

"That kid's over 6 years old," said the grouchy car conductor, "you'll have to pay the fare."

"Why, conductor," the mother protested, "I've only been married 5 years."

"All right Lady—I won't tell. I just want the kid's fare."

Calexico Celebrates Completion of Highway Link Across Desert Sands

By **JULIEN D. ROUSSEL,** Secretary California Highway Commission

CONTRIBUTING color and international spirit to the occasion, General Gabriel Gavira, Governor of the northern territory of Lower California, and his military staff, resplendent in gold-braided white uniforms, participated on Sunday, May 3d, in the dedication by Governor Frank F. Merriam of the new alignment of the old Calexico-Yuma Highway in Imperial County.

Three thousand persons witnessed the ceremonies and attended a barbecue close to the banks of the East Highline Canal which marks the eastern rim of Imperial Valley's irrigated area near Calexico.

The new road crosses the desert from the eastern edge of Imperial Valley, joining Highway No. 80 at Midway Wells. It parallels the All-American Canal on the north for twelve and a half miles. The Midway Wells junction is 10 miles west of the rolling sand dunes which are well known to motorists entering California over the southern transcontinental highway.

JULIEN D. ROUSSEL

GOVERNORS EXCHANGE AMENITIES

Governor Merriam and Governor Gavira, the principal speakers exchanged amenities and their expressions of mutual good will further cemented the cordial relations existing between their respective countries.

Accompanying the Mexican territorial chief were his Secretary of State, Jose Maria Mendoza Pardo, his chief of staff, General Miguel Molinar, and army officers. Representing California with Governor Merriam were Assistant Director of Public Works Justus F. Craemer, Harry A. Hopkins, chairman; Timothy A. Reardon, member, and Julien D. Roussel, secretary of the California Highway Commission; E. E. Wallace, State Highway Division Engineer; Senator Ed Fletcher of San Diego; Senator Ben Hulse of Imperial; Chairman Ed Hastings of the San Diego Board of Supervisors; Assemblyman Charles W. Stream, San Diego, chairman of the Assembly Highway Committee; Assemblyman Clarence R. Walker of Imperial; Judge Ralph H. Clock of Long Beach, and other officials of San Diego and Imperial counties.

Governor Merriam accepted an invitation extended by Governor Gavira to attend the opening of the new Tia Juana-Ensenada highway in the near future.

An ancient beach line, formed by a great inland body of water, which once occupied the Imperial basin, furnished the rock and sand used to pave the new link in the State Highway System, which is known as Section D of Route 202.

Imperial Valley's silt soil produces amazing crops of alfalfa and winter vegetables, but for road building purposes it is worse than a total loss. The discovery of this old beach line with its ample supply of hard gravel and sharp sand was a fortunate incident for valley road builders. Located within three miles of Route 202, it has made possible the construction of a high class road at comparatively low cost.

ONCE INLAND SEA

Geologists have an explanation for the presence of this ancient beach at a point 260 miles from the Pacific Ocean and nearly 100 miles

(Continued on page 12)

BUILDING DESERT HIGHWAY NEAR CALEXICO. Top—Excavating thousands of tons of ancient beach gravel to provide surfacing material. Center—Grading by tractor and roller scraper and, at right, oil mix subgrade provides substantial base for trucks delivering plant mixed asphalt surfacing. Bottom—Finishing surface course through sand dunes. Roadsides not completed.

Ancient Beach Makes Desert Highway

(Continued from page 10)

from the headwaters of the Gulf of California. Tens of thousands of years ago, they say, the gulf extended its long arm far inland to the base of San Jacinto Mountains. The Colorado River, entering this original gulf at a point not far from the present site of Yuma, Arizona, poured millions of tons of silt into the salt waters annually, and eventually erected a huge dike across the basin. At a later date the water evaporated from the inland sea which had been created above the silt barrier, leaving the Imperial basin of today.

The original beach line of the gulf can still be traced around the rim of the valley by the presence of sea shells, and water marks on rocks.

The contract for the building of this unit of highway was awarded on October 22, 1935, the final cost of which will be approximately $163,000.

The soil conditions on the project instead of being valley silt are almost entirely fine blow sand, as part of the project traverses the sand dune country where drifting sands are continually encountered.

A rather novel feature of the project was the treating of the loose sand with SC-2 oil in order to bind it sufficiently to provide a suitable subgrade for the bituminous treated surfacing. One thousand nine hundred tons of oil were required to convert the fine desert sand into a substantial base to carry the trucks delivering the plant mixed asphalt surfacing.

The grading consisted of moving 134,000 cubic yards of sand for a 30-foot highway, 20 feet of which is being paved. The 5-foot shoulders are to be oiled.

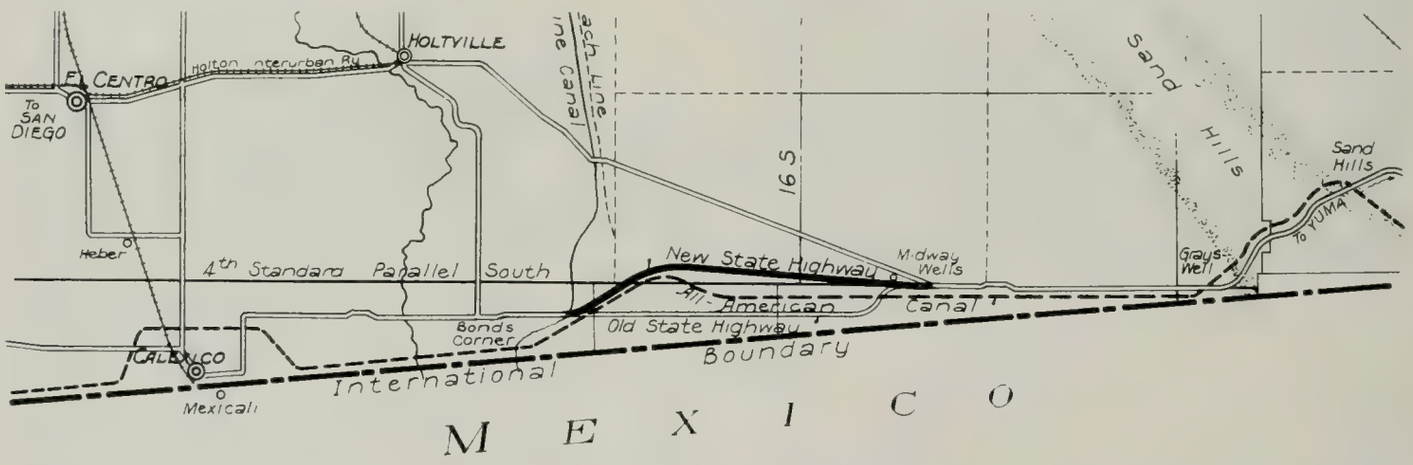
The surfacing material, composed of gravel from the old beach line, was mixed in a large plant with medium curing liquid asphalt and spread in three courses of two inches each. This, with the oiled base, makes a highway nine inches thick. The new work as it was pushed forward across the desert had to stand the test of the loaded construction trucks and trailers, the heaviest allowable on the highways.

With 1900 tons of liquid asphalt used in the surfacing and a like amount of road oil in the base, a total of 3800 tons or 110 tank cars, it is believed that a high record has been made for asphaltic products per mile in California highway building.

A screening plant was erected with 1000-ton capacity every 8-hour shift, from which by a 24-inch belt conveyor the gravel was fed to the cold elevator of a steel asphalt mixing plant of the same capacity. The plant was erected astride the old beach line, which is a strip of gravel and sand varying in width from 100 to 200 feet. The gravel deposit is from 8 to 12 feet deep.

All rolling on the subgrade and surfacing is done by pneumatic tires, a special "roller" having been devised with a 4-wheel drive truck equipped with three 40 x 8 tires on each rear wheel. This roller has navigated the treacherous sand without difficulty and furnished compaction per square inch equal to that of an 8-ton tandem roller.

The project is under the supervision of E. E. Wallace, district engineer at San Diego; E. E. Sorenson, construction engineer, and R. C. Payne, resident engineer.



Timothy A. Reardon Resigns from California Highway Commission Board

IN ORDER to devote his entire time to the State Division of Industrial Accidents and Safety, of which he is the chief, Timothy A. Reardon, of San Francisco, resigned as a member of the California Highway Commission on May 6th.

Mr. Reardon received one of the first official appointments of the late Governor James Rolph, Jr., being named to the Highway Commission in January, 1931.

At the time he accepted the post of Highway Commissioner, Mr. Reardon had behind him a distinguished record of twenty years as president of the board of public works of San Francisco and a long tenure as superintendent of public works of that city. He was elevated to the presidency of the San Francisco Board of Public Works when James Rolph was first elected mayor of the bay metropolis and throughout the lifetime of the late California governor they were intimate friends.

REBUILT SAN FRANCISCO

In the great rebuilding program in San Francisco following the fire of 1906, Mr. Reardon had an active part. His long familiarity with public work coupled with an intense interest in good roads caused Governor Rolph to appoint him a member of the California Highway Commission.

As a young man, Mr. Reardon decided that he would forego a college education and devote himself to learning a trade. He became an apprentice boilermaker. He early took a leading part in Union Labor affairs and became nationally prominent in labor movements. His long years of endeavor in this direction won him his appointment as head of the California Division of Industrial Accidents and Safety.

RESOLUTION ON RETIREMENT

At the meeting of the Highway Commission at Monterey on May 6th, the following resolutions were adopted and ordered spread upon the minutes:

WHEREAS, the Honorable Timothy A. Reardon is retiring as a member of the California Highway Commission to devote his entire time to his increasing duties as Director of the Department of Industrial Relations of the State of California, and

TIMOTHY A. REARDON

WHEREAS, Mr. Reardon has served with distinction as a member of the California Highway Commission for a period of about six years, having brought to that position a ripe and valuable experience by reason of his service for the period of twenty years as President of the Board of Public Works of the City and County of San Francisco, and a life devoted to the cause of labor, and

WHEREAS, Mr. Reardon has always rendered to the other members of the Commission the most kind, courteous and helpful assistance in analyzing and solving the highway problems of the State at large,

NOW, THEREFORE, BE IT RESOLVED, that the members of the Commission do hereby express their regret that Mr. Reardon is severing his connection as an active member of the Commission, but extend to him their best wishes for the fullest measure of success in his important position as Director of the Department of Industrial Relations, and cordially invite Mr. Reardon to attend the meetings of the Commission whenever he has the opportunity to do so and to afford to them the benefit of his long experience and wise counsel.

Highway Planning Report Adopted

(Continued from page 1)

"We have come thus far," said Colonel Chevalier. "The question now is whether to accept highway improvement as a logical place for the solving of unemployment, or to go back to the policies we pursued from 1900 to 1929. It is my belief that the time has arrived when our national and state highway programs must be removed from the category of unemployment relief and returned to the status of legitimate engineering and construction development.

"As we approach the crossway shall our work be an experiment or be a progressive development? The expenditure of funds should be controlled by business philosophy and conducted through business principles and methods."

The speaker said that among phases of highway development calling for extensive study at this time are: (1) the underlying economics of integrated highway transportation, (2) methods of conserving present investments in our highway systems, (3) logical extensions of present systems with the development of new routes to meet future traffic needs, (4) increasing the safety of highway transportation, and (5) education of the public to a proper appreciation of highway problems.

"One of the important means of bringing about this public recognition of the importance of motor transportation and highway development in our national affairs," Colonel Chevalier said, "is the establishing of a common understanding among all the industries and agencies which have a common interest in motor vehicle transportation.

"This group is far more extensive than is evidenced at first glance and includes a long series of industries and individuals from producers of raw materials to the proprietors of filling stations and garages. There are now employed in the motor vehicle industry 4,200,000 people, a number that places it next to agriculture. Let it not fall lower."

Colonel Chevalier declared that highways and the businesses directly connected with them represent one-tenth of the national income and one-tenth of the gainful employment in America today. He attacked the idea that a highway once built never should need rebuilding and scoffed at the claim that the country has all the roads it needs. He said highway commissioners should not hestitate to ask, in the interests of the people who pay for the highways, that new roads be built and old ones be reconstructed to meet modern conditions.

"No private business," asserted Colonel Chevalier, "would think of running with obsolete equipment, and the public business of motor transport artery building should not.

MUST REBUILD HIGHWAYS

"We must rebuild our highways. They must be larger and thicker to handle the increased traffic load. The U. S. Steel Company wrote off $280,000,000 of surplus to replace equipment that had not reached its life of expectancy. They may have made a poor guess but the men at the head of that organization are supposed to have the brains of the country."

He urged a return to state support of highways, adding that "accepting Federal funds is being paid for in terms of sacrificing of autonomy and the states are enslaving themselves to the Federal government by depending too much upon it financially for highway building.

However, Federal aid is a part of our national program in highway construction. It should be kept up. It is written into the programs of the states. To stop regular Federal aid for a few years as an economy program is like keeping the sun from rising to save heat.

The Phoenix meeting was presided over by Preston G. Peterson, chairman of the Utah Road Commission and president of the Western Association of State Highway Officials. In opening the session, he called attention to the regional character of highway problems in the west and the need for the continued activity of the association in studying highway management, design and construction in the public-land states.

PARALLEL ROADS RECOMMENDED

A report of a special committee appointed to study standardization of state highway planning work in the west was adopted, the association approving its recommendations, which included:

State Control of All Roads Favored

(Continued from preceding page)

"In the classification of roads for the purpose of estimating necessary improvements, roads shall be divided into three types: 4-lane highways, 2-lane highways, and single-lane highways."

The committee recommended against more than 4 lanes of pavement, favored the building of parallel roads in such cases where traffic requirements are in excess of 4-lane requirements, and, under the classification of 2-lane highways, further divided the classification into 9 divisions for each of the subheads "flat, rolling and mountainous," based on such features as safe speed, width of surfacing, curvature and grade.

Highway financing was reviewed by Gibb Gilchrist through the period of local bond issues popular fifteen years ago, through the state bond issues, Federal aid and the present gas tax era.

ALL ROADS UNDER STATE

"In my opinion," said Mr. Gilchrist, "highway financing has about completed a cycle, through local, state and Federal agencies and, if we are not to return again to a demand for local financing of farm-to-market roads, the states must begin to take over and operate the present local road systems."

Mr. Toms took for his subject "The Function of a State Highway Department in the Field of Highway Transportation."

"The present trend," he said, "is toward state control of all public roads, and the expansion of the state systems makes the problem more complex because available funds must be allocated with the greatest care."

HIGHWAY MANAGEMENT IN INFANCY

He concluded by pointing out that highway design and construction have now passed into the field of established technique, but the problems of highway management are in their infancy and will be one of the major considerations for state highway departments during the coming years.

An interesting paper on "Highway Practice in Germany" was read by Dr. Hewes. He described the design and construction of the national highway system now being built in Germany.

The association passed resolutions urging the appropriation by Congress of $20,000,000 for the fiscal years 1938 and 1939 for the construction of forest roads and highways, also endorsed appropriations by Congress for elimination of railroad grade crossings, secondary roads for 1938 and 1939 and a continuance of the past policy of Federal aid for highways and the building of forest roads, Indian roads, park roads and public highways.

PROTEST AGAINST DIVERSION

The diversion of gasoline funds again was protested and legislatures were asked to guard against any such tragedy as using gasoline funds for other purposes than actual highway use. In this connection a resolution was passed protesting the sale of motor vehicle fuels other than for government uses on government military and other reservations upon which no state tax was paid.

In connection with a discussion on safety, a resolution was passed pointing out to state regulatory bodies that engineering and construction of highways are not responsible for accidents or deaths where modern standards in construction are used; that these accidents and deaths are caused by a nonobservance of rules, regulations and laws on the part of motor vehicle operators and pedestrians.

In the election of officers, R. H. Baldock, State Highway Engineer of Oregon, was elected president; Harry A. Hopkins, Chairman, California Highway Commission, vice president; and K. C. Wright, State Highway Engineer of Utah, secretary.

Denver, Colorado, may be the next place for the meeting.

$31.50 PER "HORSE" IN 1925 REDUCED TO $7.80 TODAY

Back in the more or less gay nineties, a team of horses that would create at least a favorable impression when drawing the family rig up Main Street cost approximately $300. If breeders and dealers in horses had been able, in the course of a decade, to effect great improvements in horse flesh and at the same time reduce the price of a team from $300 to less than $80, amazement and a great acclaim would have risen throughout the land.

The point is that a comparable result has been attained by designers, manufacturers and sellers of automobiles.

The man who bought an automobile in 1925 paid an average price of $31.50 per horsepower for his vehicle. Today, the price per "horse" is $7.80.

Blast Opens Last Tunnel Barrier on Feather River Highway Project

By **G. M. WEBB**, Resident Engineer, Division of Highways

MARKING an event of major importance in the progress of construction on the Feather River State Highway, Route 21, engineers of the Division of Highways on May 7th supervised the setting off of a dynamite charge that opened up the heading of Tunnel No. 3, near Pulga, one of the two tunnels through Grizzly Dome on the picturesque new route.

The blast removed a rock wall that constituted the last barrier on the road project. When the work of enlarging and clearing the northernmost entrance to Tunnel No. 3 is completed, heavy equipment will be enabled to pass through the great bore for the task of grading the last two mile section remaining to complete the Feather River Highway.

The blast was set off by Construction Engineer C. S. Pope of the Division of Highways. Other officials present included Assistant District Construction Engineer Perry Louden; District Equipment Superintendent George Siebert; Superintendent Edward Rawson of Camp 30; Superintendent George Waste of Camp 28, and the writer.

THREE TUNNELS REQUIRED

There are three tunnels on the Feather River Highway. No. 1, about 33 miles east of Oroville on the Arch Rock section of the road, is 265 feet in length. Nos. 2 and 3 under Grizzly Dome, a monumental pile of granite towering from 1000 to 2000 feet, are 390 feet and 1172 feet in length, respectively.

Rapid construction progress is being made on the new highway. Approximately 35 miles of the project from Oroville to Grizzly Dome are practically completed. About 2.3 miles of heavy grading between Grizzly Dome and the Rock Creek bridge remains to be done. Between this bridge and the Storrie bridge 2.6 miles of road have been practically finished, and between Storrie bridge and Tobin bridge 1.5 miles are under construction. A stretch of 30 miles between Tobin bridge and Keddie is almost completed.

Excavation in Tunnel No. 2 will be completed about June 1.

The construction of the three highway tunnels in the most rugged section of the Feather River Canyon, between Oroville and Quincy, has been under way since December 17, 1934. A center heading is completed through tunnel No. 1, and the enlargement is in progress. Tunnel No. 2, has been completed through the solid granite of Grizzly Dome. Tunnel No. 3 heading was broken through the north portal by the blast of May 7th.

DETAILS OF CONSTRUCTION

The finished cross section of the tunnels will be 30 feet, 4 inches in width and 22 feet, 2 inches in height, which includes sufficient space for lining should it become necessary. The spring line is 7 feet above profile grade.

The first step in the construction of Tunnel No. 1 was boring a center heading 14 feet wide and 8 feet high. Drilling for blasting was accomplished with four drifting drills mounted on two eight-foot columns with three-foot arms. The muck was removed by hand methods with cars and track. Two crews, working eight hour shifts, one drilling and blasting and the other mucking, advanced the heading an average of five feet per day.

Excavating the enlargement consists of removing a ring of rock, 6 to 8 feet in thickness. This is being done in one operation by ring drilling and vertical down holes. Two eight-foot columns, supporting four drifting drills, are set up in a vertical position in the previously completed center heading, $3\frac{1}{2}$ feet on each side of the tunnel center line.

From this setup, holes are drilled radially in the sides and top at the proper angle to space the ends of the holes at two-foot centers.

FULL RING BLASTED

Two rings, three feet apart, are drilled without moving the columns. Vertical down holes are drilled in the bottom section with hand held rock drills in advance of the ring drilling. A full ring is blasted in each shot. The top and sides are fired with instantaneous detonators and the bottom with delays in order to throw the muck away from the face and avoid obstructing the heading.

The correct angle of the drills to accurately space the radial holes is determined by means

(Continued on page 18)

FEATHER RIVER TUNNEL BLAST scenes when bore No. 3 was holed through May 7th. Top picture, left to right, shows District Equipment Superintendent Siebert, Superintendent Rawson and Resident Engineer Webb being greeted by Superintendent Waste, Assistant District Construction Engineer Lowden and State Highway Construction Engineer Pope as they crawled through hole after blast. Center—Mr. Pope setting off blast and cloud of smoke and debris caused by explosion. Bottom—Dynamite charges in heading ready to fire showing: 1—Breast holes; 2—Lifters; 3—Cut holes.

GRIZZLY DOME TUNNELS of the Feather River Highway officially designated as No. 2 and No. 3 are shown in the above sketch by Paul Green, Assistant Highway Engineer of District II. Tunnel No. 3 was blasted through May 7th. It is 1172 feet long with 4 adits or windows. Tunnel No. 2 is nearly completed.

Drilling Methods on Feather River Bores

(Continued from page 16)

of a clinometer devised on the job. Muck from the enlargement is being removed with a 75-h.p. diesel tractor and scraper.

The enlargement of Tunnel No. 2 was excavated by a different method. A top heading, 14 feet wide and 7 feet high, was driven in the same manner as the center heading in Tunnel No. 1. After which, four operations were required to complete the tunnel.

The first two operations consisted of removing benches approximately six and nine feet in depth, and fourteen feet wide, the first being completed before the second was started. Thus, a section in the center of the tunnel, fourteen feet in width, was completed. Following the last bench by about fifty feet, the upper halves of the blocks of material remaining on the sides were taken out to full width. Widening the sides to grade was completed in the last operation.

Hand held rock drills were used on the vertical holes in the benches, spaced two feet apart transversely and three feet longitudinally. Four transverse rows of holes were fired in each blast with delay detonators.

Holes for blasting the sides to full width were drilled twelve feet in depth and approximately parallel to center line and grade, with four drifting drills, two on each side.

The number and spacing of these holes were varied according to the condition of the rock encountered.

A 60-h.p. tractor and scraper were used to remove the muck from the enlargement.

Four portable compressors, having total rated capacity of 1660 cubic feet per minute, furnish compressed air for 12 rock drills. The compressors are connected to one four-inch air line, 3200 feet in length.

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EARL LEE KELLY ..... Director
JOHN W. HOWE ..... Editor

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GOOD ROADS PAY PUBLIC

Highways pay their way by reducing the operating costs of vehicles using them, and on heavily traveled roads they return substantial profits to the public, says the Bureau of Public Roads after a study of the mileage of vehicle travel in three states in comparison with highway expenditures. Annual payments for highways, the bureau reports, amount to slightly more than one cent per mile of vehicle travel on all highways in Wisconsin, Michigan and Minnesota, according to figures collected by this bureau of the U. S. Department of Agriculture. In Wisconsin and Michigan, the payment is 1.08 cents per mile, and in Minnesota 1.1 cents per mile.

Analysis of highway costs and travel on the state systems, which include Federal-aid roads, of Wisconsin and Michigan shows that payments amount to .83 cent and .86 cent per mile of travel respectively. The figures for county roads are 1.23 cents in Wisconsin and 1.66 cents in Michigan.

The lower costs for main highways agree with the well established rule that large volumes of traffic make possible the construction and maintenance of high-type surfaces at a very low cost per mile of travel.

The actual saving in vehicle operating cost resulting from replacing a dirt road with a smooth, hard surface has been variously estimated and is probably not less than 3 cents a mile. On this basis, says the bureau, a large mileage of highways is paying tremendous profits to highway users. Actual payment of gasoline taxes and motor vehicle fees, when distributed in proportion to travel on different roads, show that many highways are earning substantial profits for the public.
—Earth Mover.

13,000,000 Workers Normally Employed on Construction Jobs

"In connection with the value of public works as a stimulant to recovery," Congressman A. F. Beiter of New York said in a speech before the House on March 24, 1936, "much data has been published to show the direct gainful employment furnished through the construction industry. This has been broken down into man-hours, total cost per man-year, Federal cost per man-year, and number of people put to work directly, but little has been said regarding those finding employment indirectly. It is true that indirect labor has been mentioned by those who have pondered the problem, but the references are mainly vague.

"The ramifications of the construction industry are so numerous and important that they affect every corner of the country. The business and social activities of our country are mutually interdependent, and all must be functioning properly to create a balanced economic life. When a stimulant is applied to aid recovery, it must be injected into the blood stream of our interdependent existence. We can not hope to effectively aid recovery unless this course is pursued.

"Fortification of the construction industry does this very thing. For instance, the raw materials used in construction have widespread occurrences in nature and they must go through many stages of processing and transportation before actual use in construction works. Stone must be quarried, crushed, separated into sizes, and mixed with other materials in proper amounts. Limestone and gypsum must be quarried and converted into cement and plaster. Iron ore must be mined, shipped, smelted, and converted into structural and reinforcing steel. Cotton must be grown, ginned, shipped, and woven into fabric for tires, belts, and containers. It is definitely a progression affecting every important factor of our economic structure.

"According to figures published by the Bureau of Public Roads, approximately 122,000,000 people (1925-33) are normally supported by 47,000,000 gainful workers, 13,000,000 of whom are directly in the construction industry and related producer-goods industries. The remaining 34,000,000 are in the consumer field producing and distributing goods consumed by the entire 122,000,000.

Nine Grade Separations in Los Angeles

(Continued from page 2)

struction by means of a "shoo fly" track along Graham Avenue, which parallels the railroad.

Retaining walls are being constructed to retain the approach fills and thus avoid encroachment on the abutting property and streets. The opening for the highway under the railroad will consist of a single 64-foot roadway between piers with sidewalk opening on each side of it.

On Soto Street, which runs in a general northerly and southerly direction and crosses the important boulevards leading east from the business district of Los Angeles, two separations are being built.

MAIN LINE CROSSING

At the point where Soto Street crosses the main line of the Southern Pacific Company the street dropped down to a grade crossing with both the railroad tracks and Valley Boulevard. An overhead structure is being built here to separate these grades and a connection is being provided between the two highways. This structure will have a roadway width of 44 feet, thus providing for 4 lanes of traffic.

Farther to the south on Soto Street, where it crosses the main and the Butte Street lines of the Union Pacific Railroad, a subway under the railroad tracks is being constructed. The street is being depressed to pass under the two railroad tracks through a single 56 foot opening with sidewalks on each side of it. It was necessary to relocate a considerable portion of the railroad's track layout at this point in order to provide a practicable means of separating the grades.

Atlantic Boulevard is being carried beneath The Atchison, Topeka and Santa Fe Railway tracks where it crosses them in the vicinity of Hobart. This subway will have two 34 foot roadway openings and is being built on alignment which will rectify the curves existing at this point. A similar subway is being built at the north edge of Buena Park, under The Atchison, Topeka and Santa Fe Railway tracks, to take care of traffic on State Highway Route 171, and the LaMirada Road. This subway will have a single 44 foot opening.

Plans have also been prepared for a subway under The Atchison, Topeka and Santa Fe Railway tracks on San Gabriel Boulevard. This location is on State Highway Route 168 running from Long Beach to Pasadena along the easterly side of the metropolitan area. The finally constructed route will follow Cerritos Avenue, San Gabriel Boulevard, and Rosemead Boulevard, the present roads will be brought up to modern standards for a heavy traffic artery and new connections built wherever these are necessary. A 56 foot roadway with two sidewalks will be provided to take care of the expected traffic when this route is completed.

In addition to the separations which are being built within the limits of the metropolitan area, there are several grade separations under construction on major highways in the southern section of the State. On the Golden State Highway in Kern County, a separation with the Southern Pacific Company tracks at Delano has just been completed and another one at Famoso is under construction. The subway at Delano was financed from regular Federal Aid and gas tax funds. The one at Famoso is financed from emergency relief act funds and is well under way.

The completion of these two projects will remove all main track grade crossings from the Golden State Highway as far north as Fresno, and leave only three more main line crossings to be separated throughout its entire length.

TWO OVERHEAD STRUCTURES

State Highway Route No. 19, known as the "Jackrabbit Trail," is being constructed to modern standards between Riverside and Beaumont. At the westerly end near Riverside an overhead structure carrying the highway over The Atchison, Topeka and Santa Fe Railway tracks is to be built, and at the easterly end near Beaumont an existing narrow overhead structure crossing the main line of the Southern Pacific Company is being replaced by a new structure built to proper width and alignment. This latter structure is well along towards completion.

At Verdemont, just north of San Bernardino, an overhead is being built to carry the Cajon Pass Highway over the double track railroad of The Atchison, Topeka and Santa Fe Railway which tracks are also used by the Union Pacific Railroad.

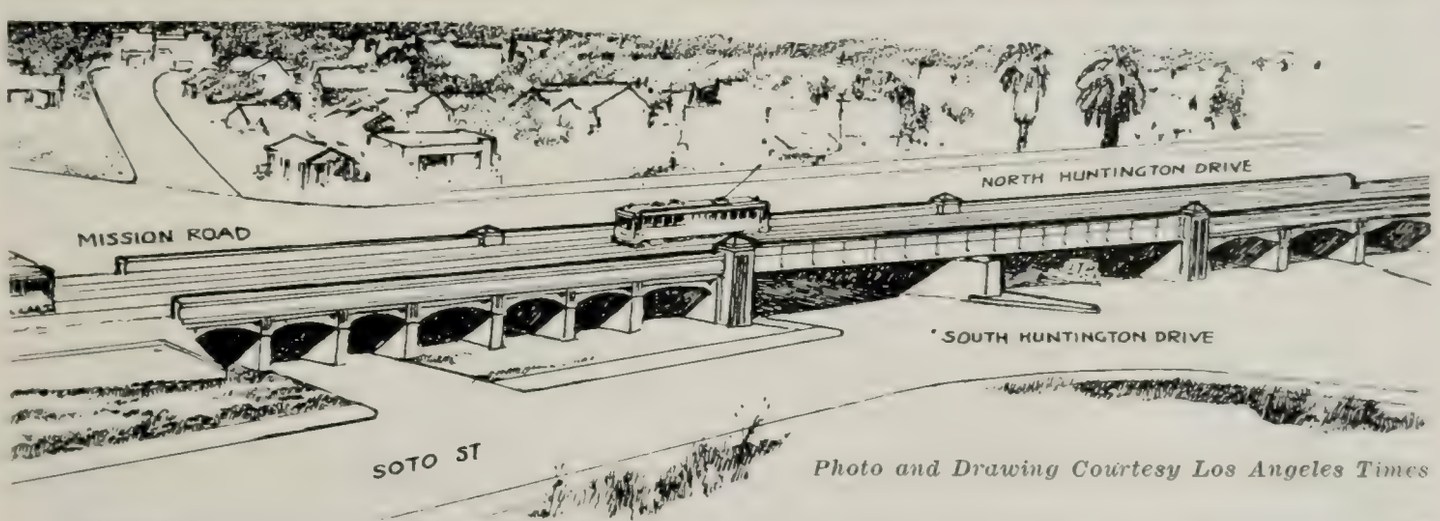

Photo and Drawing Courtesy Los Angeles Times

MISSION ROAD GRADE SEPARATION eliminates one of the busiest and most dangerous traffic crossings in Los Angeles where 560 trains daily pass a triple highway intersection on the four-track Pasadena line of the Pacific Electric Railroad.

Just to the north of Indio the highway is being rerouted to provide a proper alignment for the approach to an overhead over the main line of the Southern Pacific Company now under construction.

At Java, which is a short distance west of Needles, the existing old timber subway with its narrow roadway and low clearance is being replaced by an overhead structure over The Atchison, Topeka and Santa Fe Railway on a relocation of the highway which provides suitable alignment and width of roadway.

STATE CONTRIBUTION NECESSARY

Since the Federal regulations limit the length of highway reconstruction which can be included in the cost of the separation to be financed from Federal funds, it has been necessary for the State to supply an additional amount of gas tax funds to complete the highway relocations necessary at the Java and Indio Separations.

In addition to the above main line highway separations a subway has just been completed on Route 43 to the south of Colton, which was financed from regular Federal aid and gas tax funds, the existing concrete overhead over The Atchison, Topeka and Santa Fe Railway at Del Mar has been widened on improved alignment and plans are ready for a reconstruction of an old wooden overhead structure on Palm Avenue north of Riverside, which highway provides a short cut between that point and Redlands.

When the new route of the coast highway was constructed through Santa Barbara a

(Continued on page 30)

State Highway Right of Way Men Hold Three Day Conference in Sacramento

A CONFERENCE of right of way attorneys, agents and engineering assistants, engaged in the acquisition of lands and rights of way for the development of the State highway system and the construction of the San Francisco-Oakland Bay Bridge, was held at the headquarters office in Sacramento April 29, 30 and May 1, 1936.

This was the first meeting of the entire right of way group in several years, and consequently the time had become opportune for such a meeting to discuss, analyze and standardize, as much as possible, right of way and condemnation practice and procedure applicable to the various sections of the State of California. The sessions were both intensive and instructive and actively participated in by the personnel, all of whom are now under civil service.

RANGE OF DISCUSSION

Among the subjects discussed were: the right of way agent's part in the preparation and trial of condemnation cases; rights of way over State and Federal lands; problems of special interest encountered in the right of way work relating to the San Francisco-Oakland Bay Bridge; legislative changes affecting right of way acquisition; the acquisition of drainage easements; rights of ingress and egress; consequential damages; relocating improvements to permit construction; proper property descriptions; condemnation maps; publication of summons; appraisal problems; escrow instructions; clearance of taxes and special assessments; rights of public utilities in highways; exchanges of property; forms and their possible improvement; cooperation in right of way work with counties and cities; dedication of subdivision streets and highways; abandonment and relinquishment of rights of way; escrows, and numerous other matters relating to right of way, appraisal and condemnation practice, procedure and technique.

CHIEF CARLETON PRESIDED

C. C. Carleton, Chief of the Division of Contracts and Rights of Way of the Department of Public Works, Sacramento, presided, and C. R. Montgomery, General Right of Way Agent, Sacramento, acted as secretary at the sessions.

Others in attendance were: Clarence W. Morris, Assistant Chief of Division, San Francisco; Frank B. Durkee and Robert E. Reed, General Right of Way Agents, Sacramento; Holloway Jones, Clifford D. Good and Lincoln V. Johnson, Condemnation Investigators, San Francisco; C. A. Marsh, Supervising Right of Way Agent, San Francisco-Oakland Bay Bridge, San Francisco; S. W. Elliott, Right of Way Agent, District I, Eureka; Leland L. Rose, Right of Way Agent, John W. White and John R. West, Assistant Right of Way Agents, and W. J. Thompson, Assistant Highway Engineer, District II, Redding; Herman D. Jerrett, Right of Way Agent, and J. F. O'Hara, Assistant Resident Engineer, District III, Marysville; James B. Woodson, Right of Way Agent, Roy C. Teel and E. Kenneth Rogers, Assistant Right of Way Agents, District IV, San Francisco, and G. J. Grohman, Highway Engineering Draftsman, Sacramento.

The southern part of the State was represented by E. W. Carson, Right of Way Agent, C. L. Slusher and J. M. Sorenson, Assistant Right of Way Agents, District V, San Luis Obispo; Henry A. Sellers, Right of Way Agent, and Will Kelly, Assistant Right of Way Agent, District VI, Fresno; Frank C. Balfour, Supervising Right of Way Agent, E. N. Whittemore, Ernest M. MacDonald, Leo J. McCarthy, Neil C. Brown and Joseph F. Walsh, Assistant Right of Way Agents, District VII, Los Angeles; Edward P. Jones, Right of Way Agent, Charles L. Flack and R. M. Olson, Assistant Right of Way Agents, District VIII, San Bernardino; F. R. Baker, Associate Highway Engineer, and Serge Ray, Highway Engineering Draftsman, District IX, Bishop; B. J. Perry, Right of Way Agent, and Louis J. Malatesta, Assistant Right of Way Agent, District X, Stockton; George S. Pingry, Right of Way Agent, and A. J. Razeto, Assistant Right of Way Agent, District XI, San Diego.

He: "May I take you home?"
She: "Sure, where do you live?"

RIGHT OF WAY GROUP AT CONFERENCE—Back row, standing from left to right: Will Kelly, A. J. Razeto, Louis J. Malatesta, John R. West, E. N. Whittemore, Serge Ray, C. L. Slusher, G. J. Grohman, Ernest M. MacDonald, John W. White. Second row from back: Leo J. McCarthy, Neil C. Brown, W. J. Thompson, Joseph P. Walsh, J. M. Sorenson, F. R. Baker, E. K. Rogers, Roy C. Teal, Charles L. Flack, R. M. Olson, Frank B. Durkee, C. R. Montgomery, Holloway Jones. Seated at table, rear: Frank C. Balfour, E. W. Carson, C. A. Marsh, James B. Woodson, Herman D. Jerrett, Leland L. Rose, S. W. Elliott, Lincoln V. Johnson, Clifford D. Good, Clarence W. Morris, J. G. Standley, C. C. Carleton, Robert E. Reed. Seated at table, front: Edward P. Jones, George S. Pingry, B. J. Perry, Henry A. Sellers.

HERE'S RIGHT OF WAY "BEEF TRUST"

These four members of the group rejoice in the possession of an avoirdupois ponderosity that has won them both fame and fortune, as the ill-concealed envy of some of their slimmer confreres contributes to the fortune of good humor displayed by the weighty ones.

The collective weight of this quartette of Falstaffian Right of Way gentlemen is only one thousand and twenty pounds or sixteen thousand three hundred and twenty ounces of too, too solid flesh and the usual quota of bones.

The members of this smiling poundage galaxy are, left to right: Clifford D. Good of San Francisco, 240 pounds; B. J. Perry of Stockton, 265 pounds; Frank C. Balfour of Los Angeles, 225 pounds; Henry A. Sellers of Fresno, 290 pounds.

An old lady, in London for the first time in her life, saw on the front of a high building a glaring sign, which read: "The Smith Manufacturing Co." "Lawds a mercy," she remarked to her nephew, "I've heard of Smiths all my life, but I never knew where they made 'em."

Transplanting of Roadside Trees and a Reforestation Project Described

By **E. S. WHITAKER,** Assistant Aboriculturalist

CONSERVATION of growing trees bordering State highways where widening and realignment work are necessary and reforestation along such public roads are matters to which the Division of Highways gives studied attention.

Exemplifying the care taken to maintain natural and artificial beautification of California's highways are two projects in District 11, one of which involved an experiment in transplanting roadside shade trees and the other an attempt to augment natural reforestation.

On State Highway No. 7 (U. S. 99W), between Corning and Red Bluff, where widening and realignment work is in progress, the State twelve years ago planted oak, black walnut, ash and plane trees along both sides of the highway. It was found necessary to remove a number of these trees and they were carefully dug up and replanted in groups in wide right-of-way areas.

COST $15 PER TREE

Work was begun on March 18 under the direct supervision of Maintenance Superintendent E. L. Stump, and was carried out in a manner that allowed the entire job to be accomplished at a cost of $15 per tree.

Due to the advanced season and the type of soil, in which water available to plants was rapidly reaching the wilting point, it was necessary to first soak the tree basins so that as many roots as possible could be saved. A three-quarter-yard power shovel then dug around each tree, leaving a ball approximately 4 feet in diameter.

Roots within this ball were carefully combed free of as much soil as possible and the tree was lifted free of the soil by means of a beam fastened in a dump truck, the bed of which was raised and lowered as desired to use the beam as a hoisting lever.

With roots well covered with wet burlap, the tree was transported to a previously prepared hole and replanted. In this last operation, roots were pruned, good top soil was placed around the roots, and the tree was well watered in to insure against air pockets in the soil.

NEW LEAVES OUT

The tree crowns were also heavily thinned out, but not topped; in this way leaving terminal growth, while removing a portion of the crown growth to compensate for the loss of root area. In their new locations, the trees were basined around and mulched with straw, and they will be watered once each week during the dry season.

New leaves have already been forced out, the oaks and walnuts responding equally to the treatment. It remains to be seen, however, whether this is a last effort towards reproduction by a dying tree or the definite continuance of retracted spring growth.

However, the work, even if only 80 per cent successful, will be considered well worth the cost and will be conducive to further efforts in this type of conservation under similar conditions in the future.

BURNED AREA PROBLEM

Reforestation, under which head the second project may be listed, is a ticklish undertaking under the best of conditions. Too many times, plantings have been developed only to find natural growth springing up and completely overshadowing the imported shrubs and trees.

On State Highway route 20 which is the entrance to Lassen National Park from Redding, a forest fire several years ago destroyed native growth over a considerable area that the highway skirts and at one point passes through.

All dead trees have been felled and removed from the right of way along this stretch as a safety measure, but natural growth, due to destruction by fire of the seeds and root crowns of trees and shrubs, has been slow to reappear; and the effect to the traveler is that of passing through a devasted, denuded area.

Planting along this road would necessarily have to consist mainly of indigenous trees and because of the number required, it was believed not advisable to buy stock but to chance transplanting seedling trees direct from the forest. Even with the loss suffered by moving this native growth, the expense would not be so

(Continued on page 30)

TRANSPLANTING AND REFORESTATION OPERATIONS—Pictures 1, 3 and 4 show tree being transported and placed in new location by dump truck and lever and replanted and pruned. No. 2 group of replants in roadside area. No. 5—Burned area on State Route 20. White stakes mark transplanted forest seedlings.

Marin Approach to Cost Over $1,750,000

(Continued from page 6)

the north boundary of the United States Military Reservation at Fort Baker.

In order to secure satisfactory line, grade, and width through the rough topography on the Marin County hillsides, it was necessary to design one of the heaviest grading projects in the annals of the Division of Highways for the distance of three and one-half miles.

For convenience and facility in construction, the work was divided into two portions which were let as separate contracts; one portion involving the grading and surfacing of 3.4 miles of the highway and the other providing for the 1000-foot tunnel bore and lining with the construction of the necessary tunnel approaches. This tunnel contract covers a distance of approximately three-tenths of a mile.

1,752,000 CUBIC YARDS EXCAVATION

On April 21 the Director of Public Works awarded a contract for grading and surfacing the 3.4 miles between Waldo Point and the bridge. The major item of this contract involves the moving of over 1,752,000 cubic yards of roadway excavation, with an estimated overhaul of 13,100,000 station yards.

Other large items of the contract include 12,500 cubic yards of structure excavation, drainage structures involving 475 cubic yards of portland cement concrete, 46,000 pounds of bar reinforcing steel and nearly 12,000 lineal feet of corrugated metal pipe. The heavy duty bituminous treated crushed rock surfacing which is to be placed on the newly graded roadbed will require over 51,000 tons of crushed rock and 325 tons of various types of liquid asphalt. It is estimated that the total cost of this contract will amount to about $895,400.

The contract for construction of the tunnel, was likewise awarded by Director Earl Lee Kelly on April 21st. The estimated total cost is about $620,900.

This tunnel contract provides for the boring of a tunnel 1000 feet in length, with a reinforced concrete lining. The tunnel design provides a roadway 42 feet in width between curbs, with a 3½-foot sidewalk on one side. The total height on the center line of the tunnel will be 28 feet 9 inches and the height from the spring-line will be 23 feet 6 inches.

The design for the tunnel lining provides for two cross-sections. The heavier type of tunnel ring, designated as Section "A," consists of a ring with a crown thickness of 3 feet, the thickness at the spring-line being 4 feet 5½ inches, while the foundation is 6 feet 10 inches wide at the base. This heavy type section will be used for a short distance at each end of the tunnel.

The "B" cross-section consists of an arch ring 2 feet thick at the crown, 3 feet 5½ inches thick at the spring-line, and the foundation is 5 feet 10 inches wide at the base. This lighter section will be used throughout the greater portion of the length of the tunnel where the excavation is in solid rock.

The engineer's estimate of the quantities of work items required on the tunnel contract includes 60,000 cubic yards of roadway excavation with about 600,000 station yards of overhaul, 9000 cubic yards of structure excavation and about 51,000 cubic yards of tunnel excavation. The lining and portals involve about 2800 cubic yards of portland cement concrete and the pavement about 1050 cubic yards. The reinforcing steel necessary in both the pavement and lining includes about 370,000 pounds of bar reinforcing steel and 1,000,000 pounds of structural steel.

These two contracts, which will provide California motorists with a four-lane approach to the gigantic bridge across the Golden Gate, will be completed at a total cost to the State of approximately $1,750,000 or nearly $500,000 per mile for the entire project.

HIGHWAYS BANISH ISOLATION

"In considering the advantages that have resulted from the development of motor vehicle transportation, no less an authority than the Interstate Commerce Commission reports that 45,000 of the approximately 125,000 communities of appreciable size have no rail service or lack a freight station," according to a statement by A. L. Cricher as Chief, Transportation Division, U. S. Department of Commerce.

"Some 10 per cent of the population is found in such communities. In the absence of the bus or truck, these communities would be completely shut off from outside travel, or compelled to rely on more primitive means of transport."—*Highway Highlights.*

"Albert, bring that new radiator ornament along with you this evening, I forgot to buy a bridge prize again!"

Death of Charles D. Hamilton Leaves a Vacancy on Highway Commission

AMID a floral setting of surpassing beauty, funeral services were conducted in Banning, Riverside County, on April 27th for Charles D. Hamilton, a member of the California Highway Commission, who died at his home in that city on April 24, 1936.

Rites were held under the auspices of the Masonic fraternity and were attended by a host of friends of the dead man. Assistant Director of Public Works Justus F. Craemer and Julien D. Roussel, secretary of the Highway Commission, represented Governor Frank F. Merriam at the services.

The following resolution extolling Mr. Hamilton and expressing its sympathy for the bereaved members of his family was adopted by the California Highway Commission at its regular meeting at Del Monte on May 8th:

WHEREAS, it was with profound sorrow that the members of the California Highway Commission since their last meeting learned of the passing of the genial Charles D. Hamilton, an honored member of the Commission, and

WHEREAS, his associates on the Commission had come to admire and esteem the ability, energy and sound judgment that he contributed to their counsels and labors, and had become greatly attached to him by reason of his gracious, courteous and generous personality, and

WHEREAS, the valuable service that Mr. Hamilton rendered to the People of the State of California during his incumbency of the position of California Highway Commissioner was but the culmination of fifty years of loyal and devoted public service to his State, County and local community,

RESOLVED, that the Commissioners hereby express their deep regret on account of the loss of such a faithful friend and fellow member, and extend their heartfelt sympathy and condolence to Mrs. Hamilton and the other members of the bereaved family, and

BE IT FURTHER RESOLVED, that this resolution be spread upon the official minutes of the California Highway Commission as a memorial, and that the Secretary be directed to forward duly certified copies thereof to Mrs. Hamilton and the family, and the press of his home county, as an expression of the high regard in which Mr. Hamilton was held by the members and staff of the California Highway Commission.

CHARLES D. HAMILTON

Although Mr. Hamilton had suffered from a chronic heart ailment for some time, his passing was unexpected and was a shock to his home community and a legion of his friends throughout the State.

Mr. Hamilton was appointed to the Highway Commission by Governor Merriam on July 24th last.

Born on a farm in Macon County, Illinois, July 15, 1865, Mr. Hamilton came to California as a youth of 20. He settled in San Bernardino County, establishing himself in business at Banning with Hugh Carpenter, who also was a native of Macon County. They engaged in extensive farming operations.

Before the area that now is Riverside County was separated from San Bernardino and San Diego counties, Mr. Hamilton, in 1892, was elected county clerk of San Bernardino. During his term of office, Riverside was created and Banning was taken into the new county. Mr. Hamilton always took an

(Continued on page 32)

The following monthly report of the State Engineer detailing activities of the Division of Water Resources makes public the important fact that forecasts based on an analysis of snow survey and rainfall reports indicate that the water year 1935–1936 is the best this State has experienced since 1927. The report also states that 57 applications were received during March for appropriation of water, several of them for very large irrigation projects.

News of flood control and reclamation work, transactions of the Districts Securities Commission, progress of the Central Valley Project and other work of the division is contained in the report as follows:

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The chief activity of the maintenance force during this period has been the repair of bridges and other structures. Many of the timber bridges are now requiring repair on account of the age of the structures rather than damage caused by flood water. All of the bridges have now been in 12 years or longer, and the chief difficulty is occasioned by rotting of the piles at summer water level.

A small amount of pumping was done at the three drainage plants during this period. The three new plants being constructed by the California Debris Commission are nearing completion, pump No. 3 now being practically completed.

Relief Labor Work.

We have at this time approximately 95 relief workers on flood channel clearing in Sutter and Yuba Counties. The number of men available is decreasing rapidly, and it is thought that by June 15th none will be available. From November 12, 1935, to April 18, 1936, the following work has been done on WPA projects supervised by this office:

Project No.	*Name*	*Man.-Hr.*
884	Feather River at Nicolaus	19,732
1114	Feather River south of Marysville	4,378
1390	Sacramento By-pass (leveling)	6,776
1426	Feather River north of Yuba City	32,074
1427	Bear River	23,478
1983	Butte Slough By-pass	10,012
2230	Feather River north of Marysville	18,938
	Total Man-hours	115,388

Sacramento Flood Control Project.

Incidental construction work in connection with new levee construction has been carried on during the period. All work on the American River levee near Perkins is now completed, with the exception of fence reconstruction. We are now reinstalling a drainage pump discharge pipe at the District 765 plant near Lisbon, on the east levee of the Yolo By-pass.

A field examination over the proposed new construction on the Bear River levee system was made, in company with the U. S. Army engineers.

Flood Measurements and Gages.

Arrangements have been made with the War department to install new water stage stations on the Sacramento River at the Sacramento wier and at Ord's Ferry, and on the Feather River at Shanghai Bend. These stations will be of the most modern type, equipped with automatic continuous record instruments. The installation of a radio sending station at the Ord Ferry gage is contemplated.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Office work during the past month has consisted primarily in computing and compiling the data obtained in 1935 from which to render a report showing the diversions, return flow, stream flow and acreage irrigated in the Sacramento-San Joaquin territory and the encroachment and recession of salinity in the Delta during 1935.

The flow of fresh water in the Delta in the Sacramento-San Joaquin drainage basins has been maintained at a high rate and consequently the salinity in Suisun Bay has remained at a low level.

DAMS

Work is under way in the south on the construction of San Gabriel Number 1 dam of the Los Angeles County Flood Control District, the Cajalco Dam of the Metropolitan Water District and the Grant Lake Dam of the city of Los Angeles, Bureau of Light and Power.

Work on Long Valley dam of the city of Los Angeles will shortly be under way.

Construction has begun on Kent Dam Number 2 in San Mateo County and the construction of the West Valley Dam of the South Fork Irrigation District in Modoc County has been resumed after discontinuance due to weather conditions during the winter months.

Snow Surveys Promise Good Water Year

(Continued from preceding page)

Repairs on the Hodges Dam of the city of San Diego have been started.

Work on the enlargement of the O'Shaughnessy Dam of the city of San Francisco is proceeding satisfactorily, with the excavation of foundations in the streambed underway.

Work on the Arcata Dam of the city of Arcata has been resumed after discontinuance due to weather conditions.

Exploratory work is still under way at the Mad River Dam of the city of Eureka.

The usual maintenance and operation inspections have been carried on during the month in addition to those required for construction and repair work.

CALIFORNIA COOPERATIVE SNOW SURVEYS

At the end of March and early in April snow surveys were made at most of the established snow courses throughout the Sierra Nevada. One-hundred-fifty courses were surveyed by the State and other agencies cooperating with the State on this work. The 5 not measured were at high elevations, mostly above 10,000 feet, where during the measuring period, treacherous storms prevailed, making traveling conditions in these isolated areas so hazardous, that it was considered inadvisable to dispatch men to make the surveys.

Most of the measurements showed that on April 1st this year's snow pack, from the standpoint of water content is superior to that of any year since 1932, while at quite a few places the 1932 snow pack is exceeded. This water content of the snow pack as of April 1st, is in general indicative of the spring run off to be expected in all of the snow fed streams of the Sierra.

Using the data furnished by the snow surveys, supplemented by rainfall figures from all mountain precipitation stations, forecasts of April-July run off and also of seasonal (October-September) stream flow for the year 1935–1936 were prepared. These forecasts together with complete tabulations of the measured supporting data were published in the April 1st Snow Survey Bulletin of the division which was mailed to the public on April 15th.

An analysis of the forecasts contained therein indicate that the water year 1935–1936 approaches very nearly the 1890–1929, 40 year mean and is the best this State as a whole has experienced since 1927.

WATER RIGHTS

Supervision of Appropriation of Water.

Fifty-seven applications to appropriate water were received during the month of March, of which 22 were filed by the Division of Grazing of the Department of the Interior, for stock watering purposes in Kern, Inyo, Modoc and Lassen counties. A committee for the Mojave River County Water District filed an application proposing an appropriation of 200 second feet from Mojave River for the irrigation of 10,000 acres; Levee District No. 1 of Sutter County filed an application proposing 15,000 acre feet of underground storage by diversion from Feather River for the irrigation of 20,000 acres and Sutter Water District of Yuba City filed an application proposing an appropriation of 75 cubic feet per second from Feather River for irrigation purposes.

Seventeen applications were denied during the month; 15 were approved; 4 permits were revoked and 10 licenses were issued.

ADJUDICATIONS

Middle Fork of Feather River (Plumas and Sierra Counties).

Field work was commenced under the proceeding on April 15, 1936. A survey of irrigated land and diversion systems, and a hydrographic investigation in Sierra Valley will be made in 1936.

North Fork of Pit River (Modoc County).

Field work was commenced under the proceeding on April 15, 1936. A survey of irrigated lands and diversion systems and a hydrographic investigation on North Fork of Pit River will be made in 1936.

Water Distribution.

Water master service for the 1936 season was continued on the following named streams during the past month: Owl, Soldier, Emerson, Cedar, Deep and Mill Creek Water Master Districts (In Surprise Valley, Modoc County.)

Water master service for the 1936 season was commenced in the following named water master districts on April 15, 1936: New Pine, Davis, Franklin, South Fork of Pit River, Pine, Hot Springs Valley and Big Valley Water Master Districts.

Federal Cooperation.

Final sheets of the La Pauza Quadrangle in eastern San Luis Obispo County and western Kern County are now available. This sheet is published on a scale of 1:62,500 with a contour interval of 50 feet. This work was done by the Geological Survey in cooperation with the Division of Water Resources.

IRRIGATION DISTRICTS AND DISTRICTS SECURITIES COMMISSION

Irrigation Districts

The request of Imperial Irrigation District for an investigation of contemplated improvements along the line of the All American Canal was referred by the Securities Commission to the State Engineer in order that data might be assembled for a future report.

Additional information has been assembled in regard to application of the Sutter Water District for approval of a bond issue to construct an irrigation system for lands in the vicinity of Yuba City.

Surveys Progressing at Both Friant and Kennett Dam Sites

(Continued from preceding page)

Districts Securities Commission.

A special meeting of the commission was held in Sacramento March 26, 1936, at which the following requests were given consideration:

Petition of South San Joaquin Irrigation District for approval of a plan of debt readjustment and of a plan to refund outstanding bonds through a loan from RFC, supplemented by district funds, was favorably passed upon.

Naglee Burk Irrigation District was granted permission to expend $2,388 from the general fund to aid in financing concrete lining of a portion of the canal system.

Approval was given to petition of Lindsay-Strathmore Irrigation District for payment of interest at 4 per cent per annum upon the liquidating value of bonds deposited under the RFC refunding plan.

WATER RESOURCES

South Coastal Basin Investigation.

The South Coastal Basin Investigation has proceeded along routine lines during the present month.

Investigations have been made of the water supply for eight proposed sites under consideration for the Southern California Prison.

Central Valley Project.

Progress has been made by the U. S. Bureau of Reclamation on the preparation of plans for preliminary work preparatory to starting construction on the initial units of the project. Surveys are progressing at Kennett and Friant dam sites and along the proposed route of the Contra Costa Conduit. Appraisers are working in the field evaluating lands and rights of way necessary for the construction of the project. Exploratory operations have continued during the month at Kennett and Friant dam sites under the direction of the Bureau of Reclamation. The Division of Highways is making progress in drilling the proposed site of the combination highway-railroad bridge across the Pit River.

During the month the board of Consulting Engineers engaged by the U. S. Bureau of Reclamation on the Central Valley Project consisting of Charles H. Paul of Dayton, Ohio, Professor W. F. Durand of Stanford University, Dr. Charles P. Berkey, of Columbia University and Roy V. Meikle of Turlock, accompanied by Mr. R. F. Walter, Chief Engineer for the U. S. Bureau of Reclamation, and Mr. J. L. Savage, Chief Designing Engineer, made an inspection trip covering particularly the work being carried on at the Kennett dam site.

The Department of Public Works is assisting the Bureau of Reclamation in every way possible in an effort to speed work on the project.

An Irishman went into a clothing store to buy a shirt and the clerk tried to sell him a trunk also.

"What do you use a trunk for?"

"You keep your clothes in it."

"Shure, do you want me to run around necked?"

Replanting Roadside Trees and Burned Areas on Highways

(Continued from page 24)

great as if nursery-grown trees were purchased for the purpose.

900 SEEDLINGS PLANTED

Accordingly, District Tree Foreman Evans up to the first of March of this year has transplanted over 900 trees of a year or less in age. These were mainly *Libocedrus decurrens,* the incense cedar native to that region. Although all are quite small, it is this feature that will probably decide the success of the work as to attempt to move native trees with a larger root growth would undoubtedly meet with failure unless expensive precautions were taken.

While it is true that conditions all favored this type of work in this area, the resultant growth of the transplanted trees and of any trees that may spring from seed, will be closely observed and results one way or the other will influence the reforestation of similarly affected roadside areas along State highways.

TWENTY GRADE SEPARATIONS IN SOUTHERN CALIFORNIA

(Continued from page 21)

concrete structure carrying Las Positas Road over the highway was built. This structure joined an old and unsightly wooden structure over the adjacent Southern Pacific tracks. This old portion of the structure over the railroad is being reconstructed as a feeder road project and will remove an eyesore on the otherwise attractive route through the city.

Mrs. Jones could only find two aisle seats—one behind the other. Wishing to have her sister beside her, she turned and cautiously surveyed the man in the next seat. Finally she leaned over and timidly addressed him.

"I beg your pardon, sir, but are you alone?"

The man, without turning his head in the slightest but twisting his mouth to an alarming degree and shielding it with his hand muttered:

"Cut it out, Kid—cut it out! My wife's with me."

A man in a hospital for mental cases sat fishing over a flower bed. A visitor, wishing to be affable, remarked:

"How many have you caught?"

"You're the ninth," was the surprising reply.

—*Texas Highways.*

Highway Bids and Awards

For April, 1936

ALAMEDA COUNTY—Between Folger Ave., underpass and Ninth St., 0.3 mile grade and P. C. C. pavement. District IV, Route 69, Sec. Ber. Lee J. Immel, Berkeley, $31,278. Contract awarded to L. C. Seidel, Sacramento, $28,727.70.

COLUSA, YOLO, BUTTE, EL DORADO COUNTIES—Between Route 15 and Rumsey; Forest Ranch and Lomo; Yolo-Colusa county line and Grimes; Placerville and Georgetown, about 36.7 miles penetration oil treatment to be applied. District III, Route 50, 47, 88, 93, Section A, C, A, A. C. F. Fredericksen & Sons, Lower Lake, $8,429; Ed. F. Hilliard, Sacramento, $9,232; A. Teichert & Son, Inc., Sacramento, $10,052; Palo Alto Rd. Mtls. Co., Palo Alto, $9,576; Oilfields Trucking Co., Bakersfield, $8,374; Charles Kuppinger, Lakeport, $8,644. Contract awarded to Lee J. Immel, Berkeley, $8,300.97.

CONTRA COSTA COUNTY—Between county road to Byron and easterly boundary about 4.1 miles to be surfaced with plant-mixed surfacing and shoulders to be constructed. District IV, Route 75, Section D. E. A. Forde, San Anselmo, $24,392; Lee J. Immel, Berkeley, $24,505; W. H. Larson, Oakland, $25,732; Fredricksen & Westbrook, Lower Lake, $24,280; Pacific States Construction Co., San Francisco, $24,040; L. C. Seidel, Sacramento, $25,954; Independent Construction Co., Ltd., Oakland, $23,956; Hanrahan Company, San Francisco, $24,499. Contract awarded to S. M. McGaw, Stockton, $23,675.

IMPERIAL COUNTY—Between Sand Hills and 1 mile west of Yuma, 12.6 miles furnishing and applying liquid asphalt to shoulders. District XI, Route 27, Section B. Paulsen & March, Los Angeles, $3,671; Gilmore Oil Co., Los Angeles, $3,825; Regal Oil Co., Long Beach, $3,745; Square Oil Co., Los Angeles, $3,570; Lamb Transfer Co., Los Angeles, $3,769. Contract awarded to Morgan Bros., Huntington Park, $3433.50.

KINGS COUNTY—Between Hanford and Dallas School. Road mix surface treatment (shoulders), 13.6 miles in length. District VI, Route 135, Section A. Clyde A. Wood, Stockton, $6,225; Oilfields Trucking Co., Bakersfield, $6,537; Square Oil Co., Los Angeles, $8,010; A. S. Vinnell Co., Los Angeles, $6,599; L. A. Brisco, Arroyo Grande, $5,739; Leo F. Piazza, San Jose, $6,712; Stewart & Nuss, Inc., Fresno, $6,437. Contract awarded to Palo Alto Road Materials Co., Palo Alto, $5,291.50.

LOS ANGELES COUNTY—Between Lancaster and Kern County line, 8.1 miles, widen with P. C. pav't. and bit. tr. shdr. District VII, Route 23, Section G. Gibbons & Reed Co., Burbank, $60,503; M. J. B. Construction Co., Stockton, $56,073; Geo. R. Curtis Paving Co., Los Angeles, $62,001; Oswald Bros., Los Angeles, $54,804; Matich Bros., Elsinore, $51,639. Contract awarded to Basich Bros., Torrance, $47,000.

MARIN COUNTY—Between Sausalito and Golden Gate Bridge 0.3 mile, P. C. C. lined tunnel and approaches. District IV, Route I, Section D. L. E. Dixon Co., Bent Bros., & Johnson, Inc., Los Angeles, $665,428; Geo. Pollock Co., and Youdall Const. Co., Sacramento, $743,765; Guy F. Atkinson Co., San Francisco, $669,066; MacDonald & Kahn Co., Ltd., San Francisco, $723,848; Utah Const. Co., Paul J. Tyler & Winston Bros. Co., San Francisco, $654,255. Contract awarded to T. E. Connolly, Inc., San Francisco, $587,-917.50.

MARIN COUNTY—Between Waldo Point and Golden Gate Bridge 3.4 miles, grade and pt.-mix surfacing on cr. run base. District IV, Route 1, Section D. Bodenhamer Const. Co. and David H. Ryan, Oakland, $943,-241; Utah Const. Co., Paul J. Taylor and Winston Bros. Co., San Francisco, $1,196,892; Eaton & Smith, San Francisco, $930,885; Martin Wonderlich Co., Jefferson City, Mo., $892,908; Jahn & Bressi Const. Co., Inc., Los Angeles, $871,534; George Pollock Co., Sacramento, $1,374,712; John Carlin, Granfield Farrar & Carlin, San Francisco, $948,994; Guy F. Atkinson Co., San Francisco, $828,875; D. McDonald & MacDonald & Kahn Co., Ltd., San Francisco, $836,584; Daley Corp., San Diego, $1,116,581. Contract awarded to Macco Const. Co., Clearwater, $770,204.80.

MARIN and SONOMA COUNTIES—Furnish and apply penetration oil to existing shoulders between Ignacio Wye and Napa County line, about 18.8 miles. District IV, Route 8, Section A, A, B. Chas. L. Harney, San Francisco, $3,340; Hayward Bldg. Matl. Co., Hayward, $2,500; Pac. Truck Service, Inc., San Jose, $2,716; Palo Alto Road Matls. Co. Ltd., Palo Alto, $2,380; E. A. Forde, San Anselmo, $2,390; Basalt Rock Co., Inc., Napa, $2,660; Oilfields Trucking Co., Bakersfield, $2,818; C. F. Fredericksen & Sons, Lower Lake, $2,592; Helwig Constr. Co., Sebastopol, $2,640. Contract awarded to Chas Kuppinger, Lakeport, $1,970.

MODOC COUNTY—Between Adin and Rush Creek, about 5.1 miles to be graded and surfaced with road mix surf. District II, Route 28, Sec. A. Dunn & Baker, Klamath Falls, Ore., $30,621; Larsen Bros., Sacramento, $32,825; J. G. Chigris, San Francisco, $30,987; M. J. B. Construction Company, Stockton, $37,822; Isbell Construction Co., Reno, Nev., $35,657; Hemstreet & Bell, Marysville, $40,342; Leo F. Piazza, San Jose, $29,083; Poulos & McEwen, Sacramento, $35,416. Contract awarded to Fredericksen & Westbrook, Lower Lake, $25,400.02.

MODOC COUNTY—Between Juniper Creek and Alturas, 6.0 miles, grade and pene. oil treatment. District II, Route 73, Section C, D. Poulos & McEwen, Sacramento, $29,352; R. R. Carlson, Stockton, $30,338; Leo F. Piazza, San Jose, $32,989; Larsen Bros., Sacramento, $34,399; John G. Chigris, San Francisco, $37,465; J. V. Galbraith & Don A. Canevari, Santa Rosa, $38,423; M. J. B. Const. Co., Stockton, $43,089. Contract awarded to Fredericksen & Westbrook, Lower Lake, $28,407.70.

ORANGE COUNTY—In the city of Orange, Chapman Ave. and Glassell St., adjacent to the Plaza, about 0.4 mile to be paved with asphalt concrete. District VII, Route 181-182, Section Ora. Oswald Bros., Los Angeles, $29,317. Contract awarded to C. O. Sparks, Los Angeles, $23,924.75.

RIVERSIDE COUNTY—Between Bendel's Corner and Imperial County line, about 5.9 miles in length. A storm protection drainage system to be constructed. District XI, Route 26, Section G. Martin Bros. Trucking Co., Long Beach, $53,744; V. R. Dennis Const. Co., San Diego, $55,023; George J. Bock Co., Los Angeles, $46,109; C. W. Caletti & Co., San Rafael, $71,770; R. E. Hazard & Sons, San Diego, $55,478; Oswald Bros., Los Angeles, $72,376. Contract awarded to Mittry Bros. Const. Co., Los Angeles, $44,090.40.

RIVERSIDE COUNTY—Between Box Springs and 3 miles east of Moreno, about 11.7 miles to be graded and road-mix surface treatment applied. District VIII, Route 19, 194, Section C, C. V. R. Dennis Const. Co., San Diego, $162,151; Daley Corp., San Diego, $192,705; Wood & Bevanda, Stockton, $174,291; C. W. Calletti & Co., San Rafael, $185,121; Gibbons & Reed Co., Burbank, $199,775; J. E. Haddock, Ltd., Pasadena, $201,-462; Sander Pearson & Mundo Engr. Co., Los Angeles, $197,036. Contract awarded to Oswald Bros., Los Angeles, $156,069.50.

SAN BERNARDINO COUNTY—At Little Mt. entrance to San Bernardino, 0.7 mile grade and plant-mixed surfacing. District VII, Route 191, Section A. Geo. J. Bock Co., Los Angeles, $63,965; Sander Pearson & Mundo Eng. Co., Los Angeles, $87,911; Basich Bros., Torrance, $60,251; Dimmitt & Taylor, Los Angeles, $71,999; Guy F. Atkinson Co., Los Angeles, $70,684; J. E. Haddock, Ltd., Pasadena, $58,772; Oswald Bros., Los Angeles, $74,796; A. S. Vinnell Co., Los Angeles, $64,617. Contract Awarded to Geo. Herz & Co., San Bernardino, $53,710.30.

SAN BERNARDINO COUNTY—Between Santa Ana R. and Alabama St., 5.1 miles grade and P. C. C. pavement. District VIII, Route 26, Section A. Griffith Co., Los Angeles, $116,462; Sander, Pearson & Munda Eng. Co., Los Angeles, $129,122; Geo. R. Curtis Paving Co., Los Angeles, $106,346; J. E. Haddock, Ltd., Pasadena, $106,660; Oswald Bros., Los Angeles, $99,742. Contract Awarded to Matich Bros., Elsinore $93,423.85.

SAN BERNARDINO COUNTY—Construct sidewalk on viaduct over A. T. & S. F. Yards in Barstow. District VIII, Route 58, Section D. Contract awarded to Geo. Herz & Co., San Bernardino, $3,826.50.

SAN DIEGO COUNTY—Various locations applying penetration oil treatment to the shoulders, 57.1 miles.

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HIGHWAY BIDS AND AWARDS

(Continued from page 31)

District XI, Routes 77, 195, 196, Section A. R. E. Hazard & Sons, San Diego, $6,993; Morgan Brothers, Huntington Park, $6,462; Paulsen & March, Inc., Los Angeles, $7,147; Lamb Transfer Co., Long Beach, $7,317; Gilmore Oil Co., Los Angeles, $7,430. Contract awarded to Square Oil Co., Los Angeles, $6,170.

SAN DIEGO COUNTY—Penetration oil treatment to be applied to shoulders, 35.9 miles in length. District XI, Routes 12, 198 and 200, various locations. Morgan Bros., Huntington Park, $11,302; Square Oil Co., Los Angeles, $10,480; Paulson & Marsh, Los Angeles, $10,781; Gilmore Oil Co., Los Angeles, $12,151. Contract awarded to Regal Oil Co., Long Beach, $10,-032.50.

SAN DIEGO COUNTY—For applying penetration oil treatment to shoulders 10.2 miles Otay Junction to Coronado. District XI, Route 199, Section A. Gilmore Oil Co., Los Angeles, $2,499; Paulsen & March, Inc., Los Angeles, $2,409; Morgan Brothers, Huntington Park, $2,295; R. E. Hazard & Sons, San Diego, $2,508. Contract awarded to Square Oil Co., Los Angeles, $2,025.

SAN JOAQUIN COUNTY—Between Stockton and Linds Airport. About 16 miles to be landscaped. District X, Route 4, Section C & D. Leonard Coates Nurseries, Inc., San Jose, $9,823; California Nursery Co., Niles, $9,883. Contract awarded to Rexroth & Rexroth, Bakersfield, $6,454.80.

SANTA CLARA COUNTY—Furnish and apply liquid asphalt C-2 to existing roadbed between 1 mile east of Alum Rock road and Mt. Hamilton Observatory, about 17.9 miles. District IV, Route 115, Section A, B. Lee J. Immel, Berkeley, $5,712; A. J. Raisch Co., San Jose, $7,607; Oilfields Trucking Co., Bakersfield, $5,720; Palo Alto Mtls. Co., Palo Alto, $5,482. Contract awarded to Pacific Truck Service, Inc., San Jose, $5,414.50.

SONOMA COUNTY—Furnish and apply penetration oil to shoulders between Lytton and Cloverdale, about 15.2 miles. District IV, Route 1, Section A-Clvd. Chas. L. Harney, San Francisco, $2,490; Hayward Bldg. Matl. Co., Hayward, $2,175; Pac. Truck Service, Inc., San Jose, $2,263; Palo Alto Road Mtls. Co., Ltd., Palo Alto, $2,010; E. A. Forde, San Anselmo, $2,041; Oilfields Trucking Co., Bakersfield, $2,563; C. F. Frederickson & Sons, Lower Lake, $2,325; Helwig Constr. Co., Sebastopol, $2,157. Contract awarded to Chas. Kuppinger, Lakeport, $1,672.50.

SONOMA COUNTY—Furnish and apply penetration oil to existing shoulders between Forestville and Cotati and between Petaluma and Lakeville, about 19.1 miles. District IV, Route 104, Sections B, C, D. Chas. L. Harney, San Francisco, $5,121; Pac. Truck Service, Inc., San Jose, $4,105; Hayward Bldg. Matl. Co., Hayward, $3,970; E. A. Forde, San Anselmo, $4,010; Oilfields Trucking Co., Bakersfield, $4,573; Helwig Constr. Co., Sebastopol, $4,428. Contract awarded to Palo Alto Road Materials Co., Palo Alto, $3,614.

TEHAMA COUNTY—Between Corning and Proberta, 10.2 miles, grade and A. C. pavement. District II, Route 7, Section A, B. Union Paving Co., San Francisco, $223,116; Hanrahan Company, San Francisco, $221,918; Bodenhamer Const. Co., Oakland, $244,612. A, Teichert & Son, Inc., Sacramento, $246,753; Oswald Bros., Los Angeles, $249,115. Contract awarded to Peninsula Paving Co., San Francisco, $218,181.70.

VENTURA COUNTY—Between Route 2 and 1 mile easterly. P. C. curb to be constructed. Road mix surface to be applied to shoulders. Guard rail to be removed and salvaged. District VII, Route 9, Section A. J. E. Haddock, Ltd., Pasadena, $5,790; United Conc. Pipe Corp., Los Angeles, $6,586; A. S. Vinnell Co., Los Angeles, $6,751; Oswald Bros., Los Angeles, $6,952; J. P. Immel, Ventura, $7,170. Contract awarded to Robert D. Paterson, Santa Barbara, $4,684.

There was a young lady named Harris.
Whom nothing could ever embarrass.
Till the bath salts one day,
In the tub where she lay,
Turned out to be plaster of Paris.
—*Everybody's.*

"Where did you get the plot of your second novel?"
"From the film version of my first!"

Vacancy on Highway Board Left by Death of Chas. D. Hamilton

(Continued from page 27)

active interest in public affairs and in 1914 was elected supervisor from the fourth district of Riverside County, serving three terms in that capacity, the last five years as chairman of the board, from which he resigned to spend a year in travel abroad.

As a supervisor, Mr. Hamilton became an authority on the subject of highways, devoting much of his time to a study of good roads. His selection by Governor Merriam to serve the State as a member of the Highway Commission was considered an ideal one. As long ago as 1921 Mr. Hamilton headed a conference at Phoenix which resulted in an organization of California and Arizona interests out of whose efforts came the development of Highway 60, through Blythe, which now carries a large percentage of the State's interstate traffic.

Mr. Hamilton founded the San Gorgonio Building and Loan Association of Banning and was its vice president at the time of his death. He also organized the First National Bank of Banning, now a branch of the Citizens National Trust and Savings bank of Riverside. As owner of large farm and orchard lands in the Banning area, Mr. Hamilton was an outstanding figure in the almond industry of the West and for the past ten years was president of the California Almond Growers Exchange.

Mr. Hamilton was a member of the Banning Masonic Lodge and one of the early members of the Banning Kiwanis Club.

In the formative period of Banning, Mr. Hamilton served as a member of the first city council and continued to serve the city in that position for many years as well as giving his time as a member of the grammar school board of that city.

Mr. Hamilton is survived by his widow, Mrs. Theodora Noble Hamilton, whom he married in Riverside in 1921, and by a sister, Mrs. Mary Ellis.

Wife: "The garagemen sent that second-hand car you ordered, and I tried it out."
Hubby: "How many people does it carry comfortably?"
Wife: "None."

She: "Have you heard the latest definition of a 'pedestrian'?"
He: "Yeah. A pedestrian is a girl who doesn't neck."

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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Port of Eureka—William Clark, Sr., Surveyor

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Spans across the Bay Join San Francisco and Oakland

Official Journal of the Department of Public Works

June 1936

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Safety First Policy Dominates

California State Highway Construction

10% to 15% of Every Dollar for

Maintenance Also Used to Protect Traffic

By **EDWARD J. NERON,** Deputy Director of Public Works

EACH month during 1935 in the United States an average of 233 persons were killed in motor vehicle accidents. In the seven-year period, 1929–1935, approximately 225,000 accidents involving motor vehicles injured 306,000 persons and caused the deaths of 17,599.

While the figures for the first three months of 1936 were encouraging, showing a reduction of eight per cent in fatalities compared with 1935, that gain had dropped to only six per cent in April when 2460 persons were killed, 100 more than in March.

This tragic toll is a matter of grave concern to the California Department of Public Works and all that engineering skill can accomplish to make our State highways safe for the motoring public is being done by the department through the Division of Highways.

EDWARD J. NERON

Records show that only a relatively small percentage of accidents in this State can be directly attributed to road conditions. The average motorist can drive over every mile of traversable State highway at any time of day or night in perfect safety as far as road conditions are concerned.

There are instances of course where reckless speeders take advantage of safer driving conditions resulting from the straightening and widening of highways to "step on the gas" and add to the accident total. Only education and law enforcement can remove this dangerous human factor.

As a governmental agency vitally interested in the problem of loss of life and property damage from automobile accidents, it has always been recognized as a paramount duty of the Division of Highways, to contribute to the universal safety by building and maintaining safe roads.

It is estimated that from ten to fifteen cents of every dollar expended for highway maintenance purposes is used directly to safeguard traffic and pedestrians. The Department of Public Works is determined that State highway construction and maintenance shall be of a standard to allow motor vehicle traffic to move with the greatest safety.

Each phase of highway work is considered from a safety standpoint. Before a road survey is undertaken, the relative safety features of the road are determined. The width, slopes of cuts and fills, maximum rate of grade and minimum rate of curvature, minimum sight distance, etc., are tentatively established. Particular attention is given to subgrade, uniformity and nonskid quality of the surface during the stage of construction, as well as for the permanent pavement.

Of the total amount each motorist pays annually for license fee and gas tax, the sum of $3.37 goes for maintenance of the State highway system and of this 10 per cent goes directly into safety work.

Minimum pavement width of our highways

(Continued on page 8)

Governor Merriam Lays Cornerstone of New Public Works Building in Capital

UNDER a cloudless summer sky that the night before had been sullen with a threat of rain, Governor Frank F. Merriam on Thursday afternoon, June 4th, laid the cornerstone of the $750,000 Department of Public Works Building that is being constructed on the southwest corner of Twelfth and N streets in Sacramento.

With scores of distinguished guests from many sections of California seated on the speakers' platform and several hundred interested spectators in attendance, Earl Lee Kelly, Director of Public Works, conducted impressive ceremonies of dedication.

The fact that the new structure will be erected without the cost of an extra cent to the taxpayers of the State was announced by Governor Merriam, who told of the plan that will enable the Department of Public Works to own its own building outright in less than five years without any legislative appropriation or necessity of any additional tax monies.

COST AMORTIZATION PLAN

The edifice will be built with the department's own funds. It will be financed in part from the sale of the department's equity in the present Public Works Building at Eleventh and P streets, and the remaining cost will be amortized over a period of years by means of a rental charge which, including operating expense, will be considerably less than half the rental rate per square foot which normally would apply on buildings of the type of the new structure.

Dedication exercises, which began at 2.30 o'clock, were preceded by a concert rendered by the Southern Pacific Club Band of San Francisco. As chairman of the day, Director Kelly introduced Rabbi Norman M. Goldburg, who offered an invocation. Following raising of the flag by members of Sacramento Troop 32, Boy Scouts of America, Hon. Arthur Ferguson, mayor of Sacramento, was introduced.

Mayor Ferguson said the city of Sacramento is deeply appreciative of the action of the State administration in erecting a new Department of Public Works Building and a similar structure on the southeast corner of Twelfth and N streets for the Department of Motor Vehicles.

"This progressive step," he said, "has done much to help relieve the unemployment situation in our city. It has given an impetus to building activities. It brings the State government and the city of Sacramento closer together. We are proud of our State Capitol and hail with pleasure additions to it such as this building and the sister structure that will house the Department of Motor Vehicles."

George B. McDougall, State Architect and head of the Division of Architecture of the Department of Public Works, briefly described the design of the new building. He said the structure was planned so as to provide the maximum facilities for the highly specialized work performed by the various divisions of the department and the greatest comfort for the employees rather than to present an imposing appearance. However, he added, the exterior attractiveness of the building would not suffer.

In a few words, John Azevedo, the contractor whose low bid won him the contract for the building, expressed his thanks for the cooperation he is receiving from the Department of Public Works and its agencies in the work of construction.

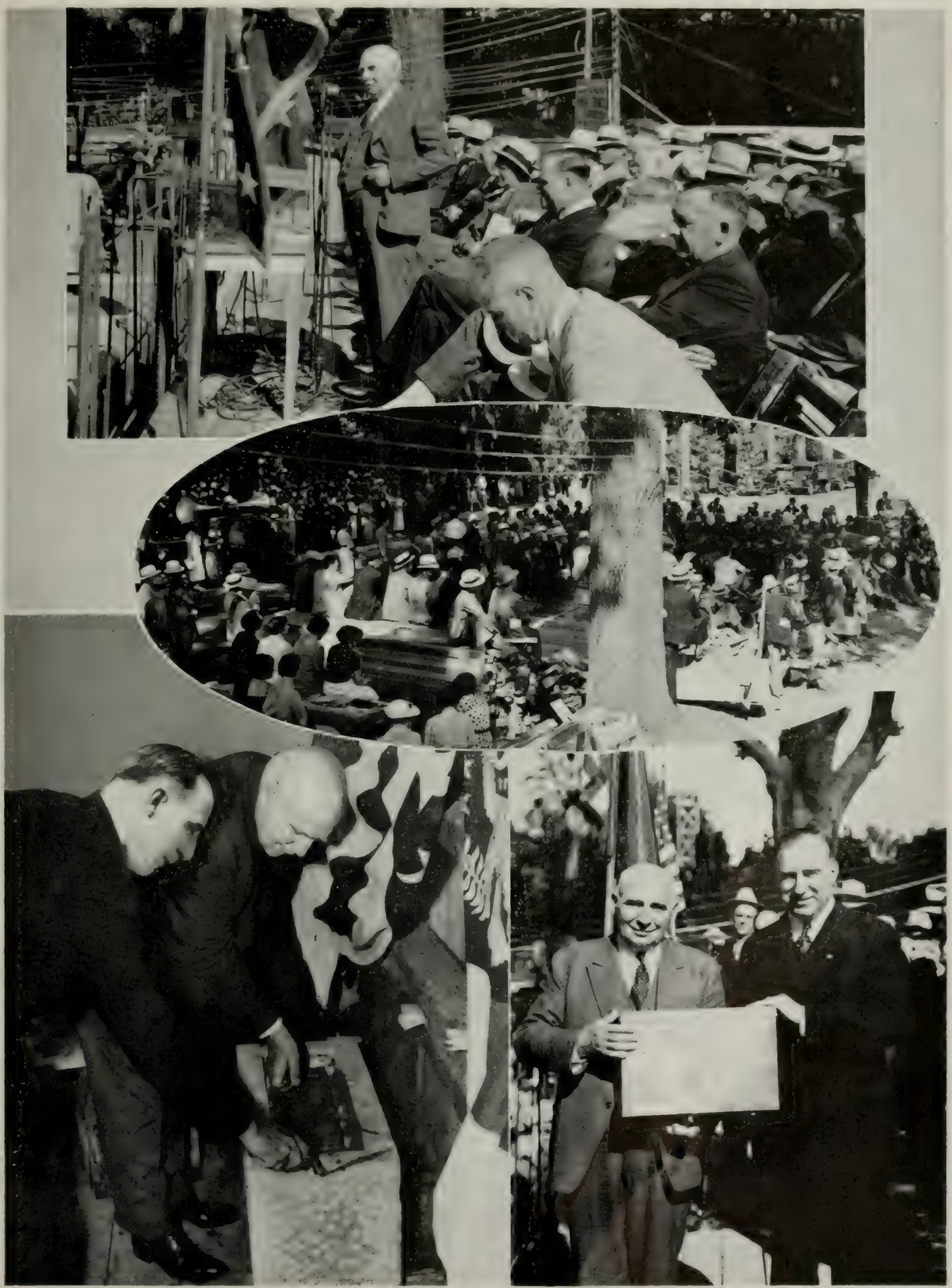
WILL SAVE STATE MONEY

As Director of Finance, Arlin E. Stockburger took a leading part in the conferences between Governor Merriam and Director Kelly, which followed the latter's suggestion that the Department of Public Works erect its own headquarters building. He worked out the plan whereby the department will be able to build a structure of its own and in the doing save the State money.

Introduced by Director Kelly as "Governor Merriam's administration banker," Director Stockburger spoke in a light vein concerning the conferences that resulted in the Governor's decision to construct two new buildings for the Department of Public Works and the Department of Motor Vehciles.

"When Earl Lee Kelly goes out after a thing he usually gets it," the Finance Director said. "And so when he came to us with his idea for this building we considered it, found it sound, and he got what he was after. This building will save the State money and the erection of it and the Motor Vehicle Building will enable the general fund of the State to purchase the present

(Continued on page 4)



SCENES AT CORNERSTONE LAYING of Public Works Building in Sacramento. At top, Governor Frank F. Merriam making an address from the speakers' stand. In center, part of crowd in front of stand. Lower right, Governor Merriam and Director of Public Works Earl Lee Kelly holding copper box filled with documents to be placed in cornerstone. Lower left, Governor Merriam and Director Kelly spreading cement over the stone.

Labor Official Commends Governor

(Continued from page 2)

Public Works Building and house there governmental agencies that now are scattered over Sacramento paying rents. It's a good deal all around."

LABOR LEADER COMPLIMENTS GOVERNOR

M. B. Kunz, secretary of the Sacramento Building Trades Council, paid compliments to Governor Merriam and to the Department of Public Works for what he termed their "whole hearted cooperation with organized labor on all construction projects undertaken by the State."

"This undertaking," he said, "has put men to work in Sacramento. It has helped the men of labor and their families. On this job, as on all other jobs of the Department of Public Works, there exists a spirit of mutual cooperation between labor and the State that is worthy of commendation. Sacramento will benefit greatly by this new construction program. I want to say that organized labor duly appreciates the splendid cooperation extended to labor by Governor Merriam and his administration."

In the introduction by Director Kelly of Ray Ingels, Director of the Department of Motor Vehicles, and the latter's response, the two officials exchanged pleasantries. Director Kelly said he promised Ingels that if he were invited to speak at the dedication of the Motor Vehicle Department Building he, in turn, would invite Ingels to say a few words when the Public Works structure cornerstone was laid.

EXCHANGE OF COMPLIMENTS

Director Ingels said the most cordial relations always had existed between the two departments and that only the imperative need for more room which confronted both agencies was separating them.

In Washington on official business connected with the Central Valley Project, State Engineer Edward Hyatt, Chief of the Division of Water Resources, was represented by J. J. Haley, Jr., Administrative Assistant, who conveyed Hyatt's regrets.

George T. McCoy, Assistant State Highway Engineer, said he and his associates were particularly glad that a new Public Works Building was being erected. He said the Division of Highways had outgrown its present offices and that the highly technical and scientific work its personnel had to perform made large and more modern quarters absolutely necessary.

"When we move into this new building," he said, "we will have the facilities we now lack which will enable us to more efficiently carry on the work we have to do."

WARNS AGAINST DIVERSION

Introduced by Director Kelly as the man who not only heads the great Division of Highways, but is the Chief Engineer of the San Francisco-Oakland Bay Bridge, "The largest bridge ever built by man," State Highway Engineer C. H. Purcell spoke briefly.

He said there were many present who could remember back to the years when the Division of Highways occupied small offices in Sacramento and was wrestling with the stupendous problem of launching a State Highway System. Through the years, he said, the Division of Highways has kept pace with the highway transportation needs of California and from time to time has had to increase its office facilities.

"Once more we have outgrown our headquarters," he said, "and must have more space in which to carry on our work. This work, the building of a greater highway system and the maintenance of existing highways are made possible by the gas tax funds."

"It is to be hoped that the gas tax funds will remain intact always. Governor Merriam has done much to prevent diversion of these monies. We are going into our new building with much work ahead and our gas tax funds must be preserved for the purposes for which the people intended them, the construction and maintenance of highways."

FATHER OF CALIFORNIA HIGHWAYS

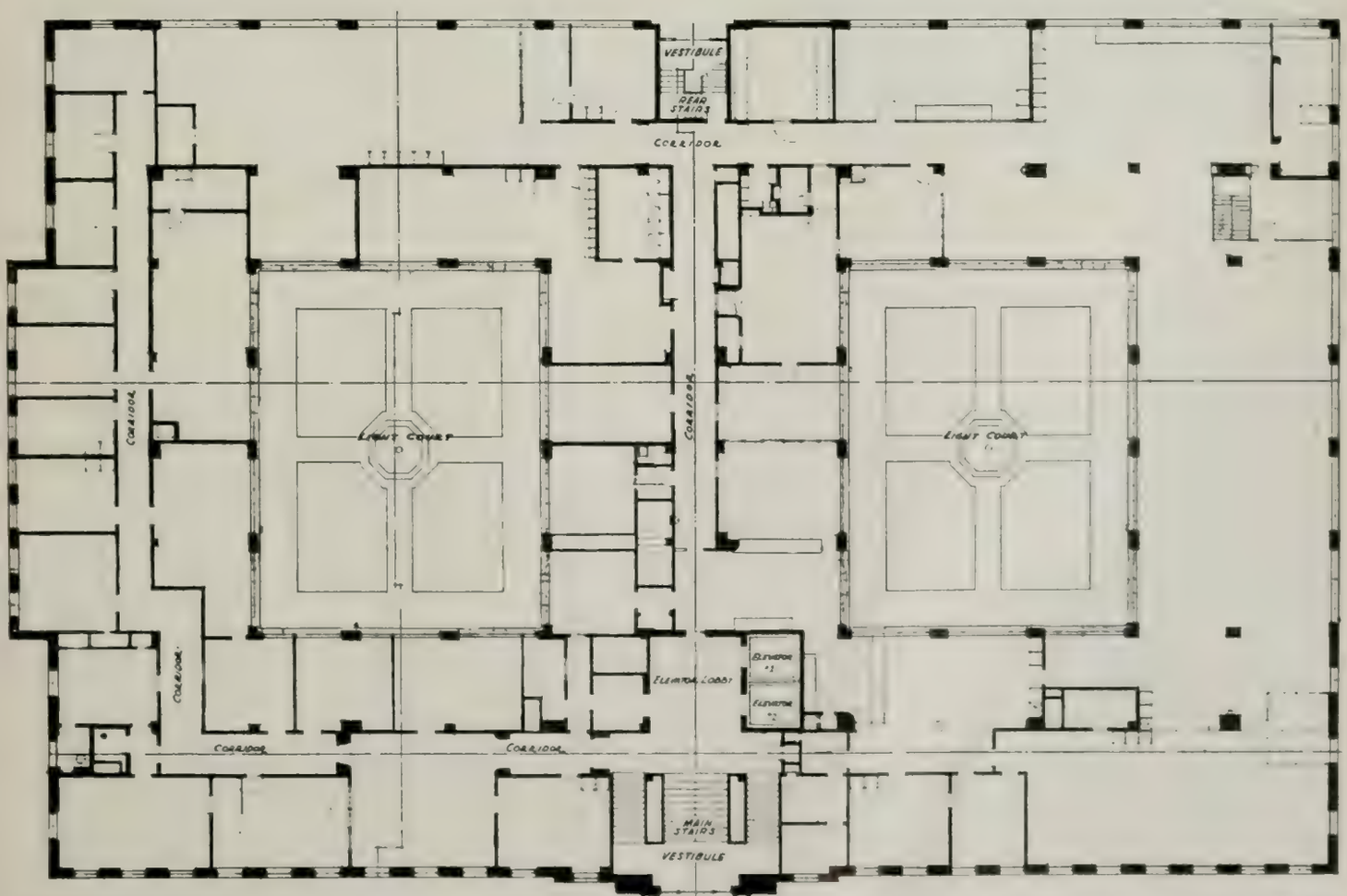
On the speaker's platform was one man who well remembered the early days of highway planning in California to which Mr. Purcell referred. He is Burton A. Towne of Lodi, chairman of the first California Highway Commission created in 1911. Director Kelly in introducing the many distinguished guests on the platform referred to Mr. Towne as "the father of California's highways."

Speaking as chairman of the California Highway Commission, Harry A. Hopkins said

(Continued on page 16)

DIGNITY AND BEAUTY characterize the simple modern design of the new Public Works Building unde construction in Sacramento, a 4-story reinforced concrete structure with provision for a fifth story.

Drawing by A. W. Eichler



GROUND FLOOR PLAN shows a width of 226 feet 6 inches and depth of 146 feet, providing 26,200 square feet of floor space, and two light courts each 48 feet wide and 61 feet deep.

Relocation Abolishes Danger Curves and Shortens Redlands-Colton Route

By **E. Q. SULLIVAN,** District Engineer

ELIMINATION of three right angle turns and two exceedingly dangerous curves on the existing route between Redlands in Riverside County and Colton in San Bernardino County will be accomplished by a realignment of a portion of the present highway and provide a more direct route into Colton. This improvement which will save five-tenths of a mile in distance between the two cities will be constructed by the Division of Highways.

The project includes the building of an easy, sweeping curve designed to do away with a hazardous right turn at the south approach to the Santa Ana River bridge which will continue to be used by north and south bound traffic via San Bernardino.

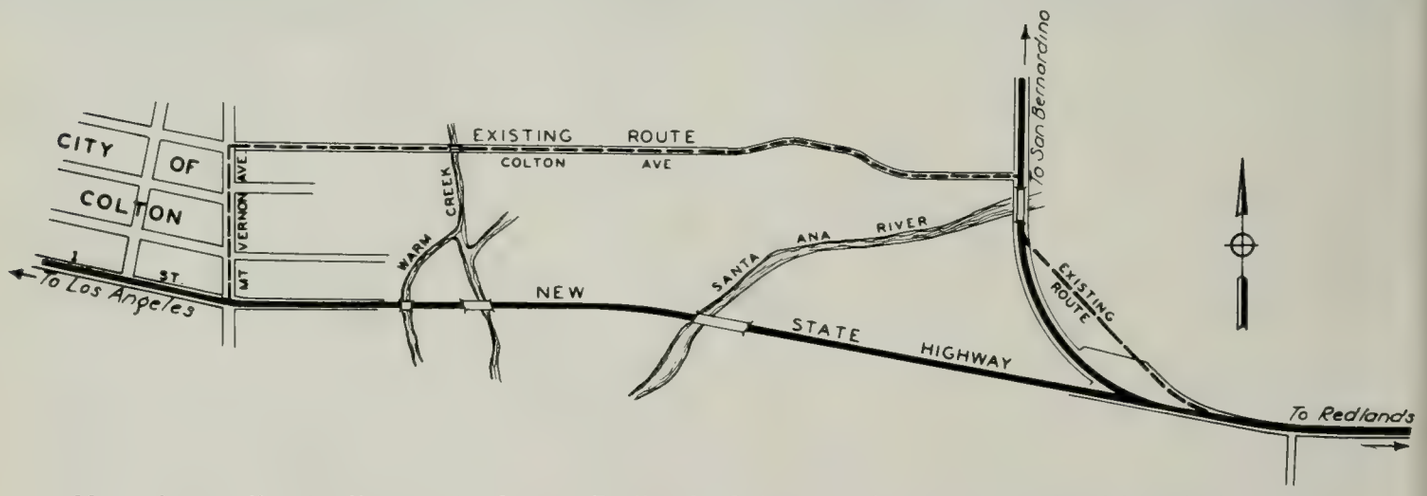
For years truck and passenger car blockades continually have occurred in the area east of Colton due to excessively heavy truck traffic between Imperial Valley and the great wholesale markets of Los Angeles, and the flow of traffic over the three transcontinental routes, U. S. 60, U. S. 99 and U. S. 70 on State Highway 26.

THROUGH TRAFFIC CONGESTED

This traffic has had to move slowly between Redlands and Colton and between San Bernardino and Colton and has been snarled up because of sharp turns. Trucks have followed a roundabout way east of Colton on which they have traveled north, west and south, negotiated a dangerous turn to cross the Santa Ana River bridge and another right hand turn to continue on the route through Colton. In the city of Colton two more right hand turns are involved in making connection with the direct route to Los Angeles.

Even were there no increase in traffic on this new section, which will serve as a connecting link in the Los Angeles-Imperial Valley lateral, the saving in operating expenses of the 3700 cars and trucks which now travel the route daily would more than justify the cost of the improvement, estimated at about $230,700.

It is figured that the yearly saving in gasoline, oil and tires, due to the one-half mile shortened distance, to the operators of the 3000 cars and 700 trucks that daily use the route, will be approximately $23,000.



Map shows direct alignment of new Redlands-Colton project compared with existing route.

The accompanying sketch map shows the existing and proposed routes and emphasizes the long, sweeping curve that will provide a safe approach to the Santa Ana bridge for traffic from Redlands to San Bernardino and Colton.

The new project involves construction of another bridge across the Santa Ana River and two bridges across the two branches of Warm Creek. The route crosses overflow land and will be built up on an embankment. Three lanes of pavement will be constructed to meet the heavy traffic demands.

(Continued on page 18)

DANGEROUS CURVE at south end of Santa Ana River bridge east of Colton to be replaced by a sweeping, easy curve as shown by dotted lines.

THROUGH CITY OF COLTON, the State Highway follows I street, which has recently been widened to provide four traffic lanes in addition to an ample strip for parallel parking.

ANOTHER SAFETY FEATURE of the Redlands-Colton relocation will be elimination of this sharp turn at the north end of Santa Ana River bridge, leaving a straight approach for traffic from San Bernardino.

Safety Exhibit at San Diego Enlarged

(Continued from page 1)

is twenty feet, two ten-foot traffic lanes. Minimum width of roadway is thirty-six feet to provide an eight-foot shoulder on either side so that the motorist may park his machine entirely clear of the pavement. Maximum grade is fixed at six per cent and minimum curvature at 300-foot radius.

Rolling grades, with sharp vertical curves of the sort which hide the oncoming car are eliminated. Curves of less than 2000-foot radius are superelevated and the crown in pavements is so slight as to be scarcely perceptible to a motorist.

Bridges are designed with a roadway four feet wider than the pavement on either end so there will be no tendency for drivers to crowd toward the center. Short vertical curves and sharp curves at the foot of heavy grades are avoided.

NUMEROUS SAFETY MEASURES

In reconstruction work a great deal is done each year to make highways safer. Horizontal curves are flattened and superelevated. Vertical curves are flattened. Shoulders are widened. Railroad grade crossings are eliminated by separation or realignment. Guard rails are installed where necessary.

Highway pavement is divided into traffic lanes by painted white stripes. Wide double stripes and reflectorized signs warn drivers against trying to pass on curves and grades where sight distance is insufficient. "School Slow" signs are kept painted on pavement near schools to protect children.

An extensive program of dust laying is carried out. Sanding of roads is carried on in foggy and frosty sections during periods of danger. Reflector signs are also installed at dangerous curves and intersections. Trees along the highways are inspected and overhanging limbs and decayed trees removed. Bridges are constantly inspected.

These are only a few of the things done by the Department of Public Works through the Division of Highways to contribute to the program of public safety.

The Department of Public Works desires to cooperate in every way possible with all State agencies, automobile associations and other organizations interested in safety measures to the end that the public may use its highways in safety.

In line with this policy the department has enlarged its highways exhibit in the State Building at the California Pacific International Exposition in San Diego.

This exhibit graphically portrays the many safety features employed in the construction, maintenance and administration of the highway system. One section is devoted to a display of all types of road signs. An enlarged traffic accident map of 1935 shows where all serious and fatal accidents occurred on State highways last year.

Photographs show conditions before and after major correctional construction work. One group of photographs shows certain sections of highways where the accident record last year was highest and which is intended to reveal that the wider and safer the road the greater tendency there is for the user to disregard the rudimentary rules of safety and thereby increase accidents. This exhibit is designed to call attention to the fact that while Division of Highway engineers provide safe and adequate roads it is beyond human power to build fool proof highways and that, therefore, intelligent use of such highways is a paramount duty of motorists.

Another exhibit is devoted to the highly important work of striping highways into two, three and four traffic lanes.

Photographs of safety construction show the effect upon traffic in cities and on the main arterials.

Double Traffic Line is a Danger Signal

One of the most important danger warnings on State highways is the orange colored line painted in the center of the double white stripes dividing traffic lanes on four-lane pavements, curves and crests of grades. Motorists are forbidden to cross these lines and motor vehicle patrol officers are enforcing this regulation.

Because orange is a color that has been found to be not clearly distinguishable in the glare of automobile headlights at night, the Division of Highways gradually is eliminating the orange stripe between the double

white lines in favor of black.

On four-lane highways the double line is continuous, but on two-lane roads it is used on grade crests and curves only. Where it is in use, signs warning motorists that they are approaching the beginning of the double stripe are placed at the right side of the highway 400 feet from the point where it starts. These signs read: "No Passing Over Orange Line On Crests of Grades." The word "Double" will be substituted for "Orange" on these signs.

Requests have been made to the Division of Highways to paint the double line on certain mountain roads, but the division is of the opinion that it would not be feasible to do so owing to the many successive grades on such highways, which would necessitate an almost continuous double line and defeat the purpose of this safety precaution.

Courtesy Auto Club of Southern California

DOUBLE LINE AND WARNING SIGN

New style double line sign is exhibited by fair auto club employee decorated with jewelry made of reflector buttons. Lower pictures show one of signs on which word "Double" will be substituted for "Orange." These signs are placed 400 feet from beginning of double lines which will have black instead of orange centers.

Ten-Mile Improvement Under Way on Indio to Palm Springs Highway

By **W. L. McFADDEN,** Assistant District Construction Engineer

HIGH up on the east wall of the towering San Jacinto Peak in Riverside County is a rock formation which stands out with startling clearness as an angel with outstretched wings poised for flight. The image is especially clear to the travelers below at the time of the day when the sun is sinking behind the mountain range.

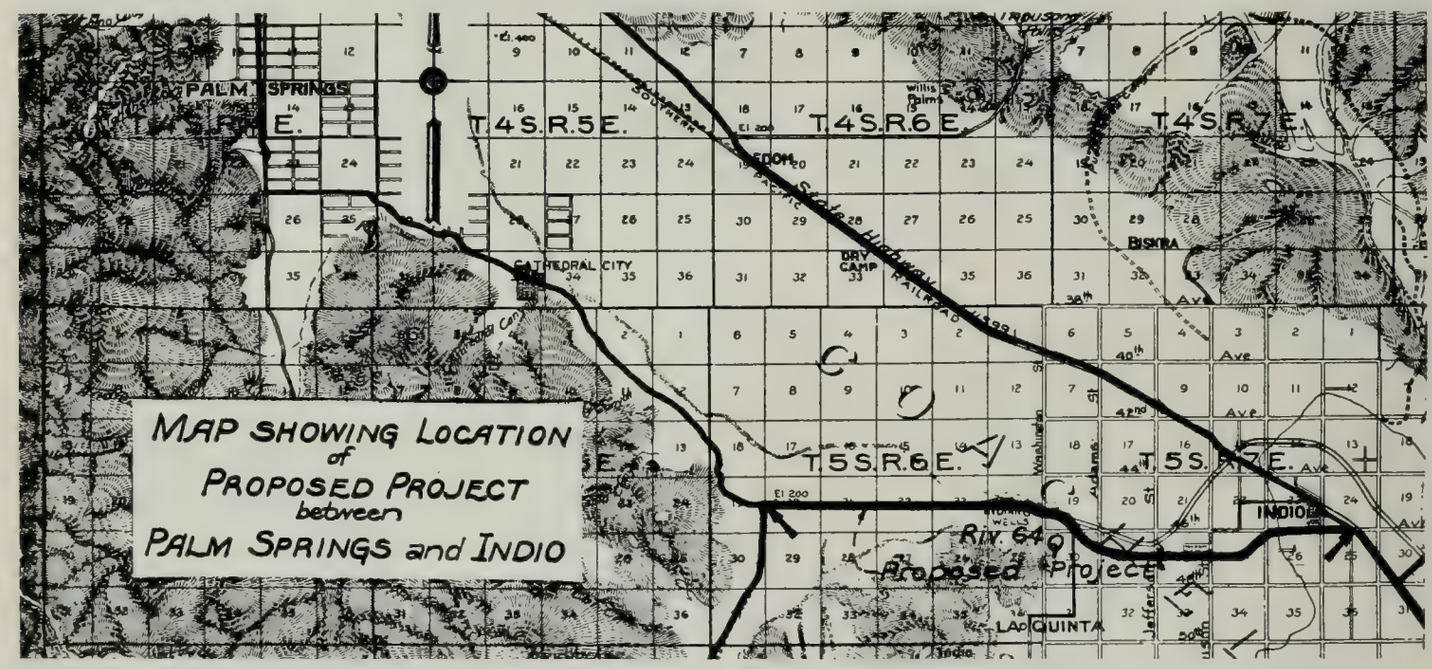
There are many legends concerning this "Angel" which has, for countless ages, looked down upon the activities of man and nature. It saw the formation and disappearance of the great inland sea a short distance to the south; the coming of De Anza, the first white man in that vicinity; and now it is watching the formation of a great agricultural center and the recreational activities at Palm Springs.

Palm Springs has, in the last few years, become a popular desert resort. It numbers among its visitors many distinguished people, some of whom soon cease to be visitors and become winter residents after building beautiful homes.

TEN-MILE PROJECT

In order to improve the highway facilities of the North Coachella Valley and its increasingly important date industry together with the communities of Indio and the desert resort of Palm Springs, the Department of Public Works, through the Division of Highways, has awarded a contract for the construction of a highway between Indio and a point ten miles westerly.

The construction is of major importance to this locality in that it serves an increasing amount of traffic each year. This increase is due to the growth of the date and citrus industries in the North Coachella Valley, the popularity of this route from the metropolitan area to the desert resorts of the Coachella and Imperial valleys, and the accessibility of the high mountain recreational areas to the valley residents during the hot summer season. A large number of the visitors to the construction activities of the Metropolitan Water District also use this road.



The present road consists of a rather narrow oil surfaced pavement, constructed a number of years ago by Riverside County, which has as its bad features some rather sharp radius curves, poor sight distances, and inadequate drainage protection.

Work was started on the new highway in February of this year and should be completed by early fall.

ESTIMATED COST $153,000

It is estimated that the new construction will cost approximately $153,000, consisting, in general, of constructing a graded roadbed 30 feet wide, treating the subgrade over a

(Continued on next page)

INDIO-PALM SPRINGS REALIGNMENT. 1—The San Jacinto "Angel" as seen from the main highway north of Palm Springs (Frashear Photo). 2-3—The new alignment eliminates several short, dangerous curves. 4—New grade on left composed of local, sandy soil and detour on right in course of construction. 5—Transportation conditions as they are at present in the date garden and orchard districts on this section of highway.

width of 22 feet with liquid asphalt by the roadmix method, and the surfacing of the central 20 feet with oil treated material also by the roadmix method. A timber bridge is to be constructed together with other adequate drainage structures to care for the occasional extreme storms that occur in this vicinity.

Many obstacles to the construction of a high type highway are encountered through this location. The new alignment traverses a terrain which varies from a nearly ideal construction material to a soft "floury" sand, similar to that found in the Sand Hills in lower Imperial Valley.

The principal construction obstacles are the soft sandy sections over which a stable subgrade must be built to support the surfacing properly. This sand-silt is so soft that the contractor's equipment has had difficulty in operating in these sections.

The soil conditions are such that nearly 30 per cent of the total cost of the work is being expended in providing for the proper

(Continued on page 12)

New Alignment of Indio to Palm Springs Sector Under Way

(Continued from page 11)

stabilization and blanketing of this unsuitable material. Even after this means is taken to correct the sandy condition, it will be necessary that material brought in for the embankment be oil treated before the surfacing can be placed.

In proper sequence, the construction involves the following steps: First—the embankments are being constructed to approximate grade with the local material, which, in most cases, consists of the sand mentioned above. Second—over this embankment is spread a blanket of imported material of a coarser composition. Liquid asphalt is then applied and mixed with this imported material to form a subgrade and mixing table for the road mix surfacing. Third—selected material of a still higher type than the imported borrow is then spread on the oiled subgrade, liquid asphalt being applied to this; it is then road-mixed, shaped and compacted to form an excellent low cost pavement.

FURNISHING LOCAL EMPLOYMENT

The minimum radius curve on the new highway will be 1500 feet and the minimum sight distance, 1000 feet, which is a great improvement over the road now in use.

The present work is furnishing employment for an average force of approximately 75 men, most of whom are employed from the immediate vicinity of the work, with resulting relief in the unemployment situation in the community.

The work is under the direct supervision of E. E. Wallace, District Engineer of District XI, at San Diego, and E. E. Sorenson, District Construction Engineer. E. L. Evans is resident engineer on the project.

Persons killed in accidents at highway-railroad grade crossings in 1935 totaled 1680, compared with 1554 in 1934. Persons injured in such accidents in 1935 totaled 4658, an increase of 358 compared with the preceding year. The number of grade-crossing accidents in 1935 was 3933, compared with 3728 in 1934. There were more grade-crossing fatalities in 1935 than in any year since 1931.

"It's scandalous to charge us $10 for towing the car only three or four miles," protested the motorist's wife.

"Never mind, dear," replied hubby, "he's earning it; I've got my brakes on."—*Answers.*

Huge Steel Machine Wraps Wire Around Bay Bridge Cables

WHILE the more spectacular construction work on the San Francisco-Oakland Bay Bridge has been attracting nation-wide attention, one of the most important phases in the erection of the bridge has been going quietly forward. This is the wire wrapping of the main cables of this world's largest bridge.

Early in March of this year the first stage of the wrapping was undertaken between Pier W-1 and the San Francisco anchorage.

Wherever the cables approach the proximity of the steel trusses, it is necessary to first wrap the cables before continuing work on the deck structure. This is so because after the erection of rails and trusses it would not be possible to get the huge wire wrapping apparatus around the cables.

CARRIES THREE WIRE SPOOLS

This apparatus takes the form of a steel ring five feet in diameter and is operated by an electric motor at the top of the machine. The ring carries three 18-inch spools of heavy galvanized wire, each spool containing 500 pounds.

From these spools, operating somewhat after the fashion of a large steel bobbin, the wire is wound around the cable at the rate of about 14 feet per hour. There is enough wire in the three spools to wrap the cable between cable bands, a distance of approximately 30 feet.

Before the wrapping is put in place a heavy coat of red lead paste is applied to the cable. Later the wrapping itself will be painted with several coats, the final one of which will be aluminum.

The wrapping wire differs from the cable wire in that it is softer and easier to bend.

Approximately 1550 feet have been wrapped to date on each cable, according to C. H. Purcell, Chief Engineer, who is directing construction of this $8\frac{1}{4}$-mile bridge.

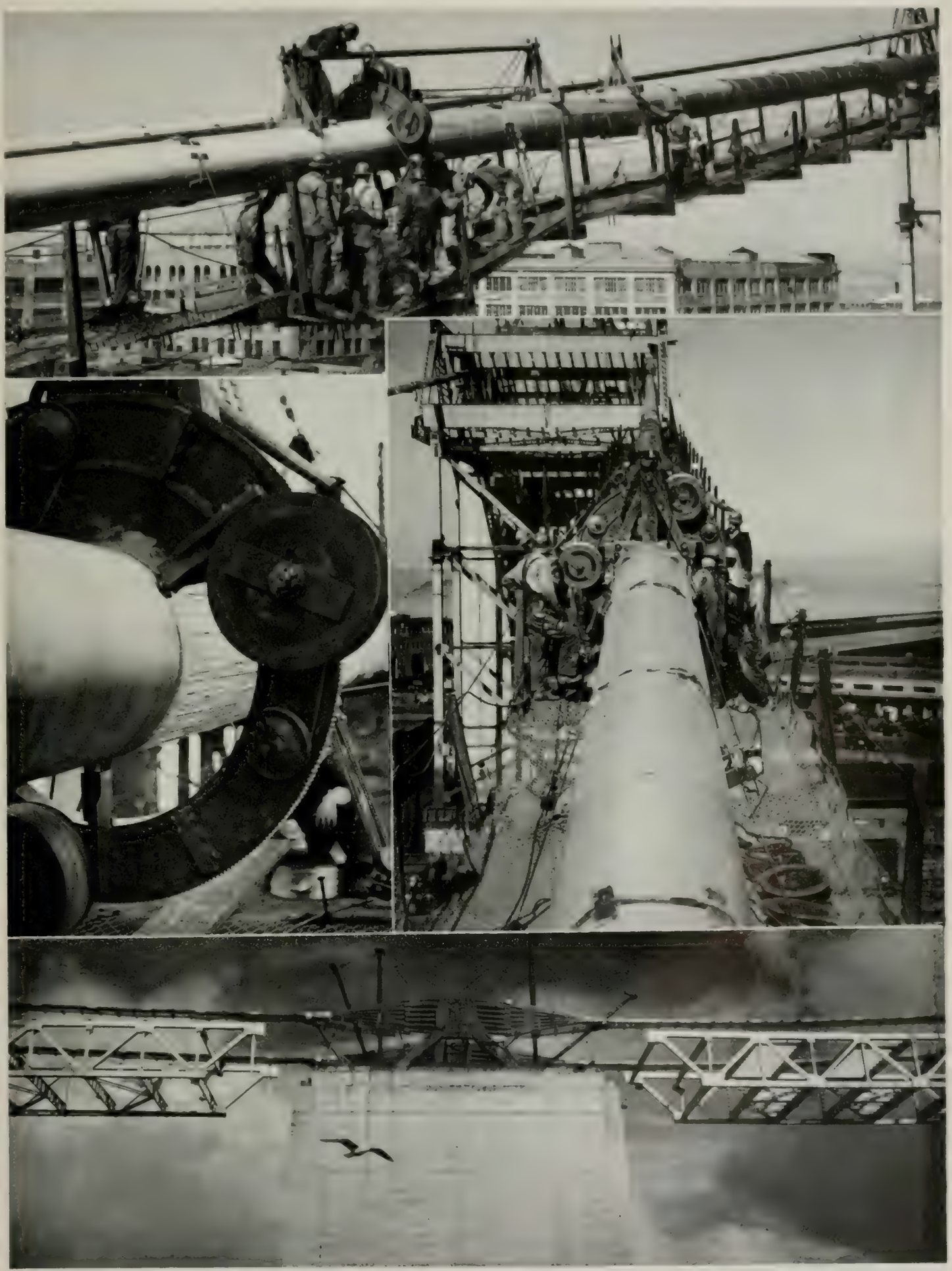
"A bachelor has left his fortune to a woman who refused him."

"And then you say we men are not grateful."

—*Buen Humor, Madrid.*

She—We really should get a new car this year.

He—What! When I'm still paying installments on the car I sold in part payment for the car I traded for the car I've got now?



CABLE WRAPPING on the San Francisco-Oakland Bay Bridge is done by means of a steel ring 5 feet in diameter operated by an electric motor on top of the machine. The ring carries three 18-inch spools each containing 500 pounds of galvanized wire. The bottom picture shows the A-frame anchorage atop the central anchorage pier for cables of the twin suspension bridges of the West Bay crossing.

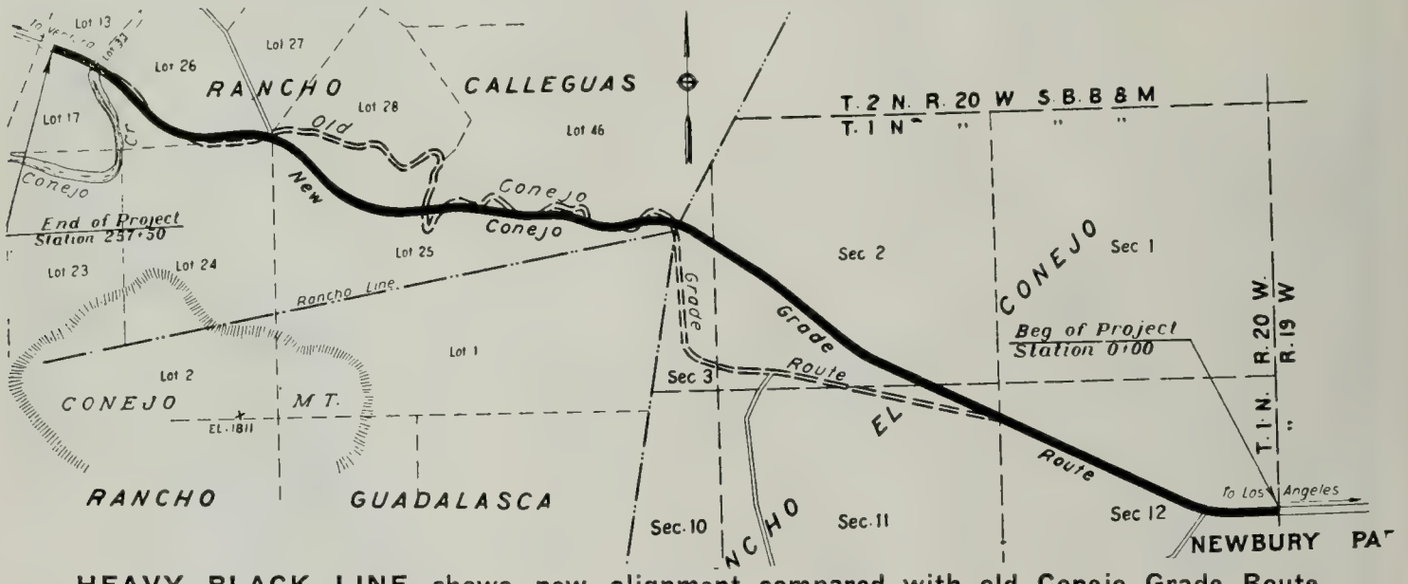
New Conejo Grade Alignment Will Reduce Forty-Nine Curves to Twelve

By **R. C. MYERS,** Assistant District Office Engineer

WITH work now 30 per cent complete, the reconstruction of Conejo Grade in Ventura County is proceeding at a satisfactory rate which should assure completion of the project by the end of the present year.

Designed to thoroughly modernize this tortuous length of highway which was originally located in 1912, the present project is of the greatest importance in improving highway transportation conditions on the "Ventura Boulevard" route between Los Angeles and Ventura.

Records of accidents compiled by the California Highway Patrol indicate that the old Conejo Grade was the most dangerous stretch of highway on this important route. The reason for the large number of accidents is apparent from a study of alignment conditions and width of roadbed which, on such a steep grade, tend to make driving conditions dangerous.



HEAVY BLACK LINE shows new alignment compared with old Conejo Grade Route.

ELEVEN CURVES TO MILE

There is a total of 49 curves on the old route with radii of curvature ranging down as low as 65 feet. The total curvature was 2067 degrees in the 5.6 miles of highway which is being relocated and reconstructed.

In order to render this much needed improvement thoroughly effective, it has been necessary to entirely relocate the highway from Newbury Park to Conejo Creek. This requires some extremely heavy grading near the summit of the Conejo Range of mountains but it has been possible to save 0.84 mile in distance which in itself is of great economic value, in addition to reducing the number of curves to 12, the total degrees of curvature from 2067 to 373 and increasing the minimum radius of curvature to 1200 feet.

The new roadbed will be 46 feet wide as compared to a 30-foot width of the old roadbed. With such a sweeping reduction in curvature and increase in width of roadbed, this grade will become as safe to drive as other sections of Ventura Boulevard and the tiresome affect of driving through sharp curvature will be entirely eliminated.

PROVIDES GREATER SAFETY

Much attention has been given to providing as long sight distance as possible, the minimum clear sight distance being 800 feet. With unrestricted view of this length, wide oil treated shoulders and freedom from objectionable curvature, driving conditions will be as safe as present standards will permit.

The Department of Public Works has recognized the importance of this project to the extent of allocating more than one-half million dollars for its construction. On the 46-foot graded roadbed will be placed a 20-foot con-

(Continued on page 17)

CONEJO GRADE REALIGNMENT—Left foreground, constructing base for big fill which will cover old highway. Upper left, new cut.

LARGE CUTS AND FILLS on new direct alignment; old winding road at right.

CUTS BEING OPENED UP on new line which crosses old road in center at right angles.

Erected Without Cost to Taxpayers

(Continued from page 4)

that amazing progress had been made in highway building since the year 1878, when the office of State Engineer was created, and out of which grew the old Bureau of Highways, established by the Legislature in 1895. He recalled that the members of the Bureau of Highways had bought a span of horses and a buckboard and had traveled from one end of the State to the other, covering 7000 miles, in their first highway survey.

"Now we have 14,000 miles of paved State highways and we have just begun to build to meet the road transportation needs of California," he said. "We are building our highways with gas tax funds and those funds must not be diverted to other uses. Governor Merriam has been and is a firm believer in the gas tax for highways and has always vigorously opposed the diversion of those monies to any other purposes. He will continue to fight diversion of gas tax funds."

Mr. Hopkins said the Highway Commissioners were highly pleased with the decision of Governor Merriam and Director Kelly to erect the new Public Works Building.

AMPLE ROOM PROVIDED

"For one thing," he said, "a fine board room has been provided for the Highway Commission and in the future the public will have ample accommodations when attending our meetings. Contractors bidding on projects and persons having official business with us will not be compelled to stand up along the walls and out in the hallways as they now are compelled to do."

Governor Merriam made the principal address of the afternoon. He briefly told the story of how Director Kelly had come to him with a proposal to erect a new Public Works Building and how a plan was worked out by himself, Director Kelly and Director of Finance Stockburger which would enable the Department of Public Works to construct a building of its own without imposing any burden whatever upon the taxpayers.

When the Division of Highways purchased the Public Works Building at Eleventh and P streets in 1927 from the private owners it was agreed that other State agencies occupying the building, including the Motor Vehicle Department, the Division of Printing and the Bureau of Criminal Identification should continue paying the same rentals they had been paying the private owners, the excess of such rentals over actual costs of operation, depreciation and repairs to be credited to their account as an investment in the building.

Under this agreement, as the other State agencies moved out the increasing work of Motor Vehicle Department demanded additional floor space.

In explaining the situation that developed between the two departments Governor Merriam said:

"We finally came to realize that at the rate rentals paid by the Department of Motor Vehicles were accruing as an equity of that department in the building it would not be long before the Motor Vehicle Department would own the building and the Department of Public Works would have to begin paying rent to the Department of Motor Vehicles. So we decided to erect a building for each department and let each pay for its own structure out of their respective equities in the present building and savings they would effect in rentals.

GOVERNOR ENVISIONS FUTURE

"Now, everybody should be pleased with such an arrangement because the taxpayers will not have to pay any additional money for the buildings and, strange as it may seem, the two departments will pay for their buildings in less than five years."

"It may sound funny," the Governor said, "that the State can build two fine structures without asking the legislature or the taxpayers for any money, but it's true and so simple that I look forward to the day when all of N street facing Capitol Park will be lined with State buildings which have been erected under the same plan and without cost to the taxpayers."

While the Southern Pacific Club Band played appropriate music, the Governor and Director Kelly placed in the cornerstone a sealed copper box containing various records, photographs and other articles which should prove of interest to future generations when the cornerstone is removed.

The new building will be a reinforced concrete structure, four stories high and will include a full basement. The building will be

Construction will be Practically Fire and Earthquake Proof

(Continued from preceding page)

226 feet long on N street and 146 feet on Twelfth street.

Provision has been made to enable the construction of an additional story in the future.

The new structure will provide 155,000 square feet of floor area which will care for the requirements of the Department of Public Works.

Due to the nature of the underground conditions it was necessary to construct on concrete pile foundations, some of the piles extending down to a depth of 40 feet below basement floor area.

Five thousand seven hundred eight cubic yards of concrete will be used to complete the structure exclusive of pile foundation.

FIRE AND EARTHQUAKE PROOF

The building will be practically fireproof and will withstand earthquake shock in so far as it is structurally possible.

Two high speed elevators are provided to meet the demands of the public. An additional elevator is provided for departmental use.

One important feature is that all offices and work spaces will be air conditioned for proper cooling in the summer and warming in the winter. Scientific acoustical treatment will be applied throughout.

"H" SHAPE DESIGN

The architectural design is in the modern manner and has been planned in the form of the capital letter "H." Special effort has been given to provide the maximum amount of window area which will provide an abundance of natural light to all offices and work spaces. The exterior walls will be finished in the original concrete.

Ample ground space has been left to permit the planting of shrubs to harmonize with Capitol Park.

The building will not be monumental in character but will be the last word in office structures bearing on practicability and efficiency.

A city visitor from one of the windswept states gazed intently at the spiral fire escape that wound its way down the rear of a very tall building.

"Gosh," he exclaimed, "that must have been a danged long ladder before the cyclone hit it."

HIGHWAY DEVELOPMENT ESSENTIAL IN ALL STATES TO MEET TRAFFIC DEMANDS

As an investment, nothing is comparable to highways. Between 1919 and 1926 North Carolina constructed $125,000,000 worth of highways. What was the economic result? The number of farms in the state was increased by 13,000 during the period when the number of farms in the country as a whole was falling off. The true value of North Carolina property increased eight times between 1900 and 1926 while in the entire United States the true value of property increased only four times. We thus have concrete proof of the business benefits from highways. I am not indulging in idle theories. I am giving authentic and attested facts.

Population is increasing; traffic is multiplying. Between 28,000,000 and 30,000.000 automobiles are in daily operation on the highways of the nation. A continuing program of highway construction is essential to meet the increasing demands for additional highway facilities in all of the States of the Union. Existing highways must be widened; other highways must be constructed.

Congress has laid its hand to the plow. The Federal Highway Act of 1921 marked the real beginning of highway construction in the United States. Time has vindicated the wisdom of the policy. Highways and progress go hand in hand.—Congressman W. M. Whittington, member of House Committee on Roads.

CONEJO GRADE TO HAVE CENTER LANE FOR PASSING

(Continued from page 14)

crete pavement with a wide oiled shoulder on each side.

TRAFFIC LANES SEPARATED

This type of construction will prevail over the greater part of the improvement except that on the steeper portion where descent is made on the westerly slope of the range, two 10-foot strips of concrete pavement will be separated by a 10-foot width of plant mixed oil surfacing to provide a traffic lane for vehicles to pass on the grade.

In the neighborhood of 770,000 cubic yards of excavation and 5,300,000 station yards of overhaul will be required in grading the 4.8 miles of new alignment. More than 100 men are employed regularly and will be given gainful employment until the latter part of the present year.

Annual Conference of District Engineers Held in Sacramento

By **R. H. WILSON**, Office Engineer

MEETING in Sacramento for a two-day conference, the district engineers of the Division of Highways' eleven districts assembled in the Public Works Building Thursday morning, June 5.

The first session was given over to a round-table discussion of ways and means of advancing the Division's construction program. Recent appropriation by Congress of funds to provide for regular federal aid to the several states during the fiscal year from July 1, 1936, to June 30, 1937, means that work in preparation of plans and specifications on many projects originally budgeted for the current biennium but which were dependent upon the 1937 federal aid will now go forward.

SPEEDS UP PROJECTS

The results of discussion at the Thursday morning meeting will assure advancement of these projects in all sections of the State with utmost speed, in addition to the forwarding of the regular program of the Division of Highways.

Thursday afternoon the session adjourned to attend the laying of the cornerstone of the new Public Works Building at Twelfth and N streets and in the evening a dinner was held at the Del Paso Country Club at which Governor Merriam, as principal speaker, explained relief legislation passed at the recent special session of the State legislature.

KEEPING CALIFORNIA IN FRONT

The sessions on Friday were given over to discussions of latest construction methods and practice, maintenance procedure and standards and financing matters. The frank and open discussion of such pertinent matters by engineers in charge of the work of the Division of Highways throughout its various districts, has been one of the most important factors in keeping California in the forefront of State highway construction.

Late Friday afternoon the conference adjourned and traveled to San Francisco, where, on Saturday morning, an inspection of the San Francisco-Oakland Bay Bridge was made with Mr. C. H. Purcell, State Highway Engineer and the Chief Engineer of the Bay structure, as their guide.

During the conference, much of the discussion was led by Mr. Purcell and the meetings were arranged by and conducted under the direction of G. T. McCoy, Assistant State Highway Engineer, and James G. Standley, Principal Assistant Engineer.

The headquarters office was represented by the following departmental heads:

R. H. Wilson, Office Engineer; Fred J. Grumm, Engineer of Surveys and Plans; C. S. Pope, Construction Engineer; T. H. Dennis, Maintenance Engineer; T. E. Stanton, Materials and Research Engineer, and R. H. Stalnaker, Equipment Engineer.

In the absence of F. W. Panhorst, Acting Bridge Engineer, the Bridge Department was represented by Assistant Bridge Engineer James Gallagher.

The District Engineers who attended the meeting were:

J. W. Vickrey, Eureka; F. W. Haselwood, Redding; C. H. Whitmore, Marysville; J. H. Skeggs, San Francisco; L. H. Gibson, San Luis Obispo; R. M. Gillis, Fresno; S. V. Cortelyou, Los Angeles; E. Q. Sullivan, San Bernardino; S. W. Lowden, Bishop; R. E. Pierce, Stockton; E. E. Wallace, San Diego.

Line Change Means Savings of $23,000 Yearly to Motorists

(Continued from page 6)

The new highway will provide a 30-foot Portland cement concrete pavement on a 46-foot roadbed with a 40-foot asphalt concrete pavement connection to I Street in Colton. These three bridges will provide 340-foot roadways with two 4-foot sidewalks. The existing route is a narrow bituminous surfaced road, which has an average total width of surface and shoulders of 20 feet, and the bridge over Warm Creek, which provides only 17 feet of clear roadway.

STREET WIDENING COMPLETED

Work on the project, which will be constructed in four units, already is under way. One contract has been completed for the widening of I Street through Colton. A second contract has been let for that part of the undertaking east of the present Santa Ana River bridge and which also includes the widening of the existing pavement to three traffic lanes as far as Alabama Street near Redlands, a distance of 5.4 miles. This contract is now under way and pavement is now being laid on that unit.

Bids were opened for the balance of the undertaking on June 4th, involving contracts for the construction of two bridges, and the other for the building of the roadway and pavement extension.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

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HIGHWAY HEAD-WORK

Motorists today are able to drive mechanically perfect cars along improved highways, guarded at every turn by uniform safety signs, but their personal safety depends entirely upon their fitness as drivers.

Federal, State and city officials are advancing toward a solution of the motoring safety problem. They are doing their part by allotting huge sums of money each year to provide for wider, improved roads; to establish safer overhead and underground railroad crossings, and to install a practical system of traffic regulation. The automobile industry cooperates by manufacturing mechanically safer automobiles. Even with this safety-minded concentration mobilized for the motorists' welfare, lowering the number of highway fatalities and injuries rests solely with each and every motorist.

Traffic officials can discard and bring obsolete motoring laws up to date, but they can't sit behind the wheel of every car on the road and advise each driver what to do when an emergency arises. The amount of skill required to operate a new model automobile is negligible, but it does take a whole lot of sanity to drive a car safely along our crowded highways.

Money, as well as necks, is saved when an automobile is driven at a sensible rate of speed. The United States Bureau of Standards has compiled figures to prove that the gasoline consumption of a car is determined by the speed at which it is driven. An automobile capable of going 18 miles on a gallon of gasoline at a speed of 30 miles an hour will do but 16.4 miles at a speed of 40 miles per hour; 14.6 miles at 50 miles per hour; 12.6 miles per gallon at 60, and at 80 miles per hour only 8.6 miles on a gallon of gasoline.

Truck Association Official Gives Some Helpful Suggestions

THE following excerpts taken from a letter written by John A. Zech, District Secretary of the Truck Owners Association of Santa Clara County, disclose the fine spirit of cooperation exhibited in general by truck owners to improve traffic conditions on our highways:

> **"Please be advised that on Monday, May 18th, I invited Captain Eddie Tressler, State Highway Patrol, to accompany me in making a general inspection of the Pacheco Pass Highway.**
>
> **"We checked heavy laden trucks descending the grade, operating under low gear at a speed of ten miles per hour, which seemed to be a feasible rate of speed with equipment under control at all times.**
>
> **Suggest Warning Signs**
>
> **"We would suggest that signs be placed with a notice to the effect that heavy laden trucks should STOP and shift gears for the down grade.**
>
> **"Also would advise a broad painted line across the highway with the words TRUCKS STOP in order that the lighter traveling public may proceed down the grade ahead of the trucks.**
>
> **"This information is a suggestion on the part of this Association as an assistance to the general public as a safety measure for the interest of all concerned.**
>
> **"I would like to be of any further assistance at any time. Thank you for the opportunity of cooperating with your department."**

"If vehicle owners as a class would give equal consideration to the observance of safety measures, our highway accident rate would undoubtedly be materially lessened," says Maintenance Engineer T. H. Dennis. "It is the practice of the Division of Highways to place gear shift stop signs for trucks on grades and we are installing such signs on Pacheco Pass."

MOLASSES USED FOR ROAD SURFACING BINDER IN INDIA

Reverting to a practice of olden days in India when a mixture of water and jaggery, a kind of coarse sugar made by evaporation from the sap of palm trees, was added to lime to produce a mortar, highway engineers in India are experimenting with molasses as an inexpensive substitute binder material for road surfacing.

A short length of road formed of lime kankar carrying heavy traffic was treated with molasses and the result was so encouraging that the process has been applied to 50 miles of roadway. The sand and molasses get worked thoroughly into the interstices of the highway by the traffic and the surface has a dark appearance, similar to a bituminous surface.

Grade Separation Project Under Way at Dangerous R.R. Crossing Near Indio

By **D. E. WARREN**, Senior Bridge Engineer

DOWN at Indio, near the Salton Sea, the traffic over State Highway Route 26 travels at a fast pace. Indio is located on the north edge of Coachella Valley in Riverside County. Near by is Palm Springs, the well known desert resort of the movie colony. But there are no other towns on Route 26 within forty miles. Therefore nearly every one traveling this portion of Route 26 is "going places."

Coming down out of the San Gorgonio Pass, to the Salton Sea, the traveler passes through miles of sparsely inhabited desert country. Near Indio, after thirty miles of desert road with a down hill grade and scarcely a turn, the driver is suddenly confronted with a sharp "S" turn across the main line of the Southern Pacific Railroad. Here the usual hazard of a grade crossing is accentuated by the prevailing high speed of traffic and the inclusion of sharp approach curves in the long straight stretches of highway.

Aside from being a hazard, this crossing is also a source of delay on an important highway. State Route 26 connects the Imperial Valley with the Orange Belt cities and the Los Angeles metropolitan area. It also carries interstate traffic to and from Arizona and eastern points via U. S. Routes 60 and 80.

DANGEROUS CROSSING FACTORS

The highway traffic at this crossing is about 3000 vehicles per day with a large proportion of heavy through trucks operating between Los Angeles and the Imperial Valley. The Southern Pacific Railway runs between these same points and about twenty trains per day cross the highway.

To eliminate the present dangerous grade crossing, a new overhead crossing is now being constructed about three miles west of Indio and about one mile further from the town than the present crossing.

In order to provide approaches of high standard alignment in keeping with the other portions of the route, the project includes the relocation of 8650 feet of highway. Fifteen hundred feet of highway on each side of the structure is included in the separation contract and the remainder of the relocation is to be constructed as a separate highway contract.

CLEARANCE FOR TWO TRACKS

The overhead structure is located on a tangent between two 2500-foot radius curves which are connected to the existing highway by curves of 5000-foot radius. The maximum grade will be 4.25 per cent, with a sight distance of 600 feet.

The structure, 168 feet long, spans space for two railroad tracks and has a thirty-four foot roadway for highway traffic. It is of reinforced concrete slab and girder construction consisting of two fifty-three foot approach spans and one sixty-four foot main span. The alignment requires a skew of 55 degrees so that the sixty-four foot main span is necessary to provide clearance for two tracks.

The end bents consist of columns which allow the approach fill to spill through. The center bents are columns combined with a collision wall. The collision walls protect the columns from the impact which might occur from derailment of a passing train, and also serve to prevent the fill from spilling out onto the tracks. The bents and deck system are designed as a continuous frame which conserves materials and lowers the deck elevation over the tracks by reducing the depth of the deck girders.

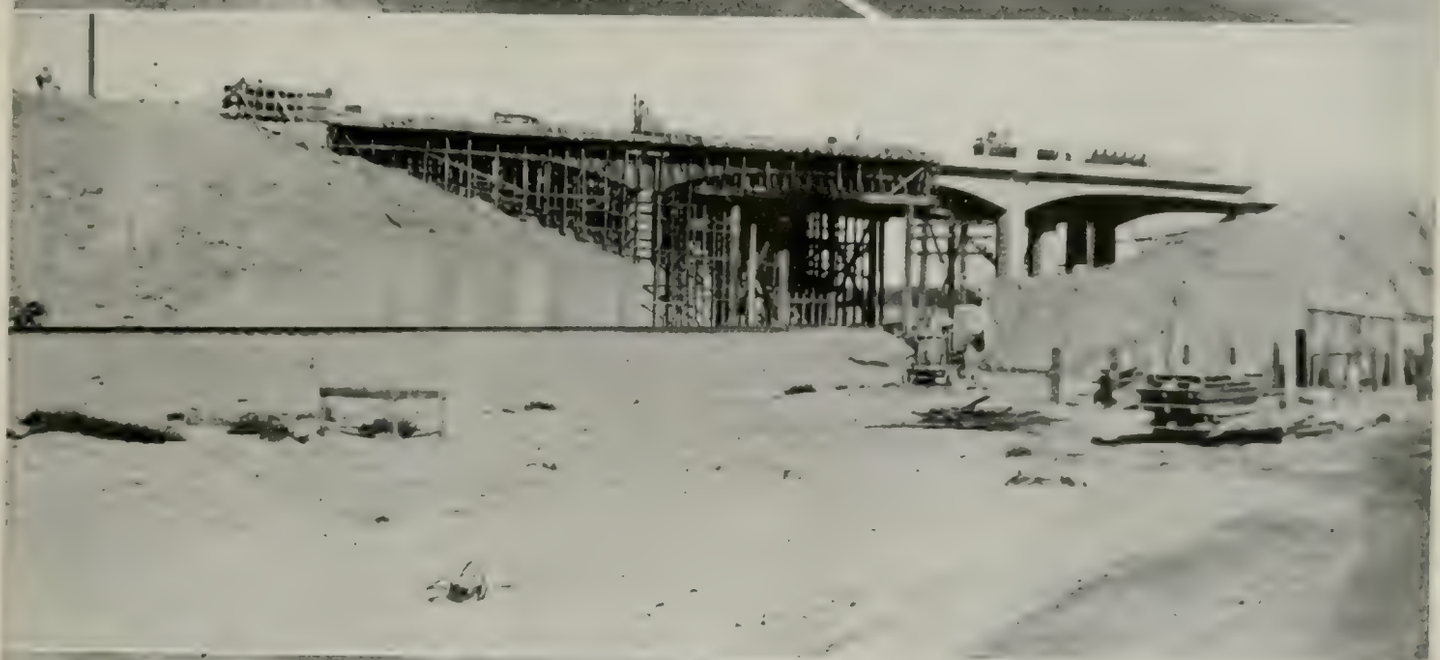
Although the structure is designed for two tracks there is but one track now in place. In order to maintain the required clearance it was necessary temporarily to shift this track seven feet.

WILD WINDS STOP WORK

Work on the project has been stopped several times because of wind and dust. The winds in this region blow almost unceasingly up and down the pass. At times the wind reaches hurricane intensity. Automobiles caught in one of these winds have been sand-blasted clean of paint on the windward side, and their windows frosted by the impact of driven sand.

Not far from the site stands a large revolvable wind tunnel which can be faced into the wind like a weather vane. This tunnel is part of experimental equipment erected by private

(Continued on page 23)



GRADE SEPARATION CONSTRUCTION NEAR INDIO on State Highway 26, the "Inland Route" through Coachella and Imperial Valleys to Calexico. At top, the present "S" curve crossing over railroad at grade, a danger spot with a traffic count of 3000 vehicles per day. In center, constructing concrete slab and girder overhead structure, 168 feet long with 64-foot main span to provide clearance for two tracks. At bottom, view of approaches to overhead structure looking southeasterly. In order to provide approaches of high standard alignment in keeping with the other portions of the route, the project includes the relocation of 8650 feet of highway.

How Laboratory Tests Aggregates for Concrete Highway Construction

By **ALLEN NICOL**, Junior Mineralogist, Materials and Research Department

THE PURPOSE of this article is to discuss only one of the various highway research problems, that pertaining to the soundness of coarse and fine aggregates, i.e., rock and sand, for use in portland cement concrete.

In many sections of the State, these aggregates come from gravel pits located on rivers which drain areas covered with a heavy mantle of sedimentary rocks. Certain types of sedimentary rocks have been found to be unsound for use in concrete highways; hence it becomes necessary to determine the percentage content of such unsatisfactory rock types in streambed gravels prior to their adoption for use in highway construction.

SATURATED WEATHERING TEST

The determination of soundness as applied to coarse and fine aggregates covers a wide range of standard tests and experimental procedure. Suffice it to say here that one of the tests used by this department as an index of rock behavior and soundness is an accelerated weathering test using saturated sodium sulphate or magnesium sulphate solutions.

After a careful preliminary petrological examination, sufficient particles of a streambed gravel or other aggregate to be tested are graded to a standard size, weighed, and the number of pieces recorded. One sample is subjected to the sodium sulphate test, and another of the same material to the magnesium sulphate test.

The samples are immersed in these solutions for eighteen hours at constant temperature, followed by a four-hour drying period at a temperature of 105 to 110 degrees Centigrade. This treatment is continued for five cycles, a cycle constituting one immersion phase and one drying phase.

EFFECT OF SALT AIR

The effect of this treatment is largely physical, similar in many respects to that of freezing and thawing. Actual freezing and thawing tests are conducted on aggregates in the highway testing laboratories of many eastern states to duplicate actual highway conditions, but in California, most of our highways are not subjected to such severe climatic conditions.

Our investigations indicate that salt air may produce concrete highway failure along our coast. Because the sulphate solutions produce a similar type of failure, this test, therefore, is an accelerated test trending toward duplication of actual highway conditions.

The general effect produced on unsound rocks is the growth and development of crystals of sodium sulphate or magnesium sulphate, with their attendant force of expansion between the grains, cracks, fissures, and capillary openings or pores of the rock during the drying phase. The sulphate solution, of course, permeates these openings during the immersion phase.

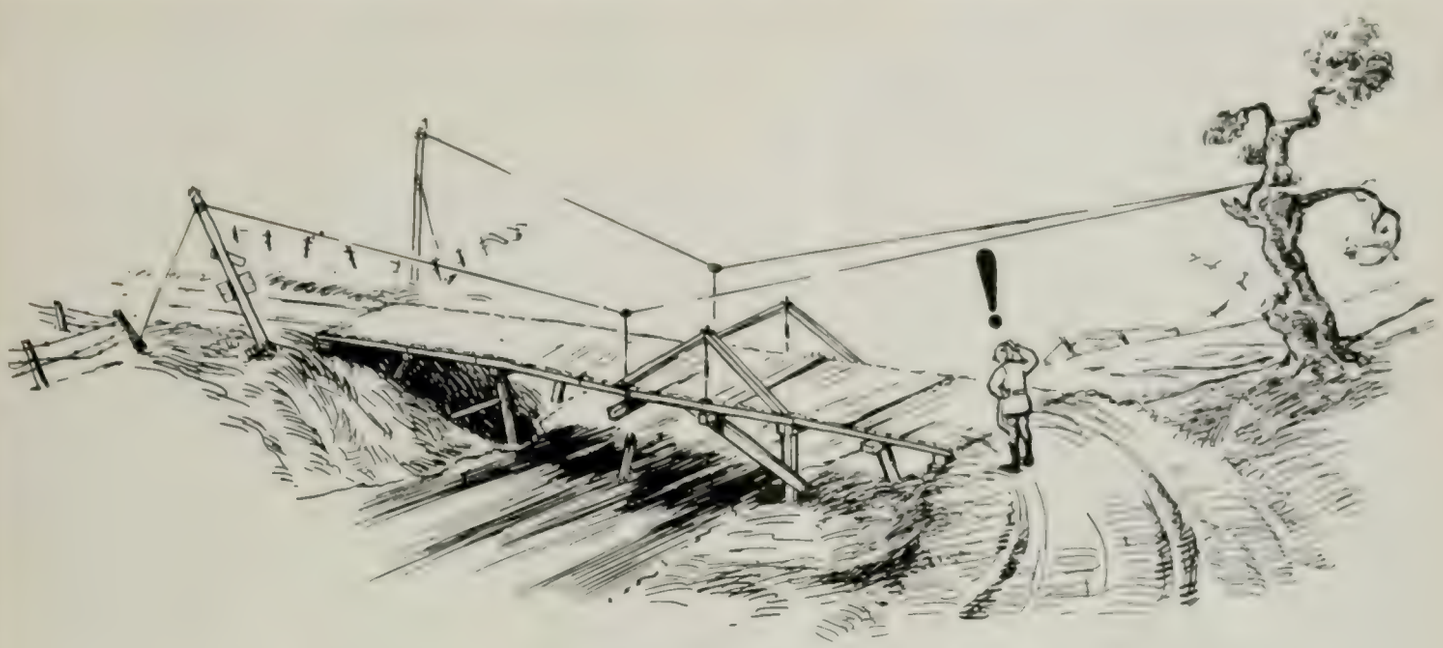
Sound rock types either do not offer very great pore space for the solutions to permeate, or are resistant to the expansive effect of the sulphate crystals. Unsound types of rocks, however, are those which usually afford considerable permeation of the solutions and are at the same time weakly resistant to the expansive force of the sulphate crystal development, with the result that these rocks split apart, disintegrate, crack, or in other ways show the effect of the salt.

SOUND AND UNSOUND ROCKS

Tests on rock samples from the eleven districts of the State show that certain types of rocks are affected seriously, whereas other types are only partially or slightly affected.

It is possible to arrange or group these rocks petrologically according to their general ability to withstand the test. As a rule, most igneous and metamorphic rocks are but slightly affected by the treatment. The exceptions of note are some rather badly altered granites or other plutonics, certain types of schists, and some secondary gneisses.

In the sedimentary rocks, it has been found that sandstones having a calcareous cementing bond between the grains are usually sound, whereas micaceous sandstones, ferruginous sandstones, many graywackes, and



WELL, WHAT TO DO?

BRIDGE INVESTIGATOR.—"All I'm supposed to figure out now is how to take a hundred bucks and make this bridge safe for traffic for another couple of years."

LABORATORY TESTS FOR HIGHWAY CONSTRUCTION

(Continued from preceding page)

conglomerates frequently show in one way or another some type of breakdown. The argillaceous or clayey sandstones, siltstones, laminated shales, and argillites usually show severe effects from the test.

Many semi-indurated clay rocks, ochers, and arkoses are similarly affected. It is desirable in highway construction to eliminate such unsound rock types wherever possible.

Each type of rock has a different breakdown reaction. Laminated or fissile shales split along bedding planes; prior to splitting apart, they swell at right angles to the bedding plane and resemble in many respects the pages of an old book. This type of swelling and splitting so characteristic of shales and some thin-bedded sandstones is extremely injurious to concrete inasmuch as the stresses set up produce cracking, "pop-outs," or other effects.

Coarse-grained sandstones generally disintegrate on the surface. Fine-grained sandstones usually crack or spall. Some micaceous sandstones show a remarkable disintegration to the extent of crumbling completely to a very fine dust. Occasionally a gneiss may by impact break along its schistosity plane.

The number of rocks affected by each test is recorded, the type of breakdown reaction noted, and the loss computed by sieve analysis.

GRADE SEPARATION PROJECT NEAR INDIO

(Continued from page 20)

parties in the hope of putting the wild energy of the winds to some useful purpose.

The only material available locally for the construction of the approach fills is sand piled up by the desert winds. This sand is so fine that it has to be wetted before it will support the equipment which loads and delivers it to the fill. After the sand is placed in the approach fills a layer of heavy selected material imported from the hills is placed over it to protect it from the wind. When completed the approach fills will be paved with twenty foot width of Portland cement concrete and eight foot asphaltic shoulders.

The approach fills covered the existing highway so a detour was constructed to by-pass traffic during construction. The detour provides a twenty-two foot roadway surfaced with four inches of asphaltic road mixed material.

The structure and adjacent roadway now under contract, are financed from Federal funds appropriated for grade crossing elimination, supplemented by State gas tax funds necessary to complete the highway relocation.

The contract for construction of the separation structure and 3000 feet of approach fill was let for approximately $105,000. J. H. Horn is Resident Engineer. The project is scheduled for completion in July.

Federal Road Chief Decries Uneconomic Highway Building

THOMAS H. MacDONALD, Chief of the Bureau of Public Roads, at a recent transportation conference at the U. S. Chamber of Commerce, in discussing policies in highway administration, said:

"There is, and has been, a tremendous pressure upon public officials for surfacing for motor vehicles, a larger and larger mileage of our public highways. This pressure has resulted in a large relative and actual increase in the mileage of the so-called low-type roadways. This statement is not intended to be critical, except to the extent that the design and cost of these low-cost roads have been forced below reasonably economical standards. The danger in this policy lies in the certain rapid increase of maintenance costs and the exclusion of necessary new construction.

"The policy here expressed of extending the mileage of new construction has been brought about by transferring large mileages, in some cases the total public road mileage within the State, to the jurisdiction of the State, without an equivalent transfer of funds.

"Both of these policies, placing an enlarged commitment against the State highway funds, have been simultaneous with a diversion to other than highway purposes of income from the special taxes on road users.

"All of these policies are tending to destroy the logical and necessary stage construction policy which was adopted by practically all of the states, by utilizing funds which should go to replace and to bring to more adequate standards the roads which have received the first stage improvement."

CALIFORNIANS PAY LOWEST AUTOMOBILE OPERATING TAX

A study of the annual cost of operating an average passenger automobile and the amount of taxes paid in connection with its operation which was made by the Highway Research Board, Washington, D. C., reveals that California motorists pay the lowest tax bills and those in Florida the highest.

Excluding the District of Columbia, where taxes were 5.5 per cent of costs, the difference between the highest and lowest tax bills (15.93 per cent in Florida and 7.51 per cent in California) was 112 per cent.

"Auntie," asked little Jane, "why do you put powder on your face?"

"To make me pretty, my dear."

"Auntie," suggested Jane, after thinking a moment, "are you sure you're using the right kind of powder?"

RESOLUTIONS PASSED BY CONVENTION OF WESTERN STATES HIGHWAY OFFICIALS

WHEREAS, the continued and adequate service to motor transportation in this country requires a well planned, orderly and economic construction and development of the highway system of our nation; and

WHEREAS, the continuance of regular Federal aid is more effective in assuring the successful application of this basic principle than are other methods of Federal appropriation; now, therefore, be it

RESOLVED, by the Western Association of State Highway Officials that this Association reiterate its previous recommendations and urge the continuance of the regular Federal aid appropriations as authorized and administered under the Federal Aid Act and amendments thereto.

WHEREAS, the Western Association of State Highway Officials believes that Motor Vehicular fees and gasoline taxes should be expended exclusively for the construction, maintenance and operation of highways; and

WHEREAS, the expenditure of road funds for other than road use is manifestly a form of unequitable taxation, now, therefore, be it

RESOLVED, that the Western Association of State Highway Officials request their local delegates to appear before the proper committees of the legislatures of the several states, when again assembled, and protest against continued or increased diversion of road revenues to other than road use.

WHEREAS, there is now before the Congress a bill sponsored by Senator Carl Hayden of Arizona and Congressman Wilbur Cartwright of Oklahoma to amend the Federal Aid Act to provide for an expenditure on secondary highways, for the elimination of railroad crossings at grade, and for the authorization of funds for the fiscal years of 1938 and 1939 for the above purposes and for the continuance of the past policy of Federal aid for highways and the building of forest roads, Indian roads, park roads, and public road highways; now, therefore, be it

RESOLVED, that the members of this association continue in their efforts to express to their congressional delegations the importance of the passage of this bill, in order to insure an orderly progress of highway improvement throughout the nation.

RESOLVED, that the Western Association of State Highway Officials point out to the regulatory bodies of the states that loss of life and property is not due to any appreciable extent to engineering or highway construction when highways are built to modern standards, but are largely attributed to a nonobservance of laws, rules and regulations on the part of highway users.

AN IMPORTANT BRIDGE RECONSTRUCTION PROJECT recently completed at Tunnel Station on State Route 4 connects this Los Angeles-Sacramento main highway near its entrance to Weldon Canyon with the Newhall-Saugus route and the Foothill Boulevard cut-off near San Fernando. The widened rebuilt structure is shown at top and below the narrow old structure.

In the Field With the Old Timers

HISTORICAL data of absorbing interest concerning the early days of highway construction in California not to be found in the matter of fact records of the State Division of Highways are revealed in reminiscences of members of the Old Timers' Club of the division.

E. E. EAST

To anyone acquainted with the State Highway System of today it is difficult to believe that only 24 years ago dirt roads, many of them almost impassable in winter, stretched from south to north and from east to west in California where now are splendid paved thoroughfares.

The membership of the Old Timers' Club is made up of men who took part in the launching of the present great highway system in 1912, who constituted the first field force of the old California Highway Commission, which in that year began the building of the modern network of standard highways that places California today in the front rank of states of the Union in the matter of good roads.

INTERESTING OLD PICTURES

Many of these men still are with the Division of Highways. Others have attained high positions outside of public service. Among the latter is E. E. East, chief engineer of the Automobile Club of Southern California, who, by virtue of his appointment as instrumentman by the original Highway Commission in February, 1912, is a member of the Old Timers' Club.

From Mr. East comes an entertaining reminiscent account of his first days as an employee of the State. He sends photographs showing a section of Route 2, (U. S. 101), in Ventura County, as it was in those pioneer times and after it was converted into a State highway. The contrast is well nigh unbelievable. The pictures were taken at a point between Springville and Rice Road.

The first California Highway Commission created seven State highway divisions and placed each in charge of a division engineer. Division VII, as designated at that time, included the counties of Ventura, Los Angeles, San Bernardino, Riverside, Orange, San Diego and Imperial. Los Angeles was Division Headquarters with W. Lewis Clark, Division Engineer, and S. V. Cortelyou, assistant, in charge.

REPORTED AT LOS ANGELES

Appointed an Instrumentman by State Highway Engineer Fletcher, Mr. East reported for duty in Los Angeles on the morning of February 15, 1912. He found that headquarters consisted of three rooms in the Union Oil Building. He humorously relates how he timidly approached the young red-headed stenographer in the outer office and presented his credentials.

"The young lady received the letter without any outward display of emotion, in fact, her attitude was rather cold and indifferent, from which I gained the impression that I did not like red-headed stenographers," says Mr. East. He was told to wait in an adjoining room.

"Upon entering the waiting room," recalls Mr. East, "I met many men with whom I was to work during the entire period of my service with the Highway Commission. Some of these men still are employed with the Division of Highways, some entered other fields, while others have taken the long road. C. G. Kolster, J. C. More, E. S. Gripper, Abe George, L. W. Cummings and Francis Hart were among those present.

$18,000,000 JUST FOR ROADS!

"During the forenoon we discussed many subjects, mostly having to do with the new job of building highways. I recall that there was a difference of opinion as to how long it would take to spend the $18,000,000 bond issue voted for good roads. Some guessed five years, others longer, while a few contended that it never could be spent as there was not that much money in the whole world."

Mr. East's first assignment was to take J. C. More's party and equipment to Ventura County, establish camp on the Hunt Ranch near the Conejo Grade, then return to Los Angeles and join Kolster's party. On the

(Continued on page 28)

WHEN COAST HIGHWAY WAS A MUD ROAD

Typical scene on present State Route 2 (U. S. 101) when Spring came to Ventura County in 1912 and State began building a highway system.

SAME SCENE WHEN PAVEMENT CAME

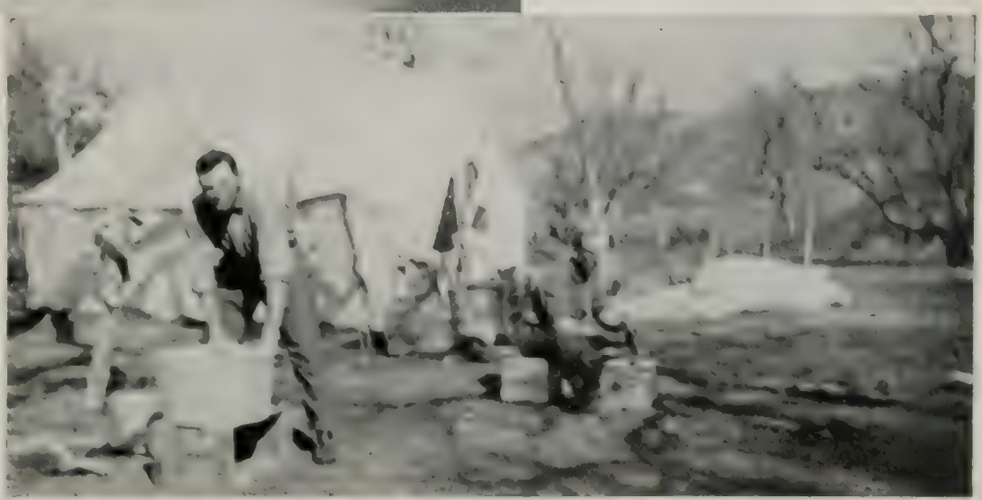
as a result of first surveys made by State highway field party of which E. E. East was instrument man, between Springville and Rice Road.

STATE FIELD PARTY OUTFIT IN 1912

consisted of a team of more or less refractory hayburners, a steel tired Davenport wagon, tents, blankets, lanterns, grub and surveying equipment.

SUNDAY WAS WASH DAY FOR ENGINEERS

E. E. East, now Chief Engineer of Automobile Club of Southern California, is man bending over the washtub in foreground. Chief of Party Charles Kolster is seated on oil can.



Two-Hour Trip of Today Took Days Over Roads of 1912

(Continued from page 26)

morning of February 16, he and the other members of the party met in a wagon yard on Lyon Street where they received a team of horses, wagon, camp equipment and supplies.

"Of the eight horses purchased or sold at that time for the use of the survey parties of Division VII," recounts Mr. East, "four were fairly good while the other four combined all the physical and mental defects found in horses. Each team consisted of one of the fairly good horses and one of the other kind.

LEARNED ABOUT HORSES

"One of these other kind of horses, I remember, among other things objected to a bridle. When we first met this horse down on Lyon Street he had his bridle on. At the end of the day, as was customary, we took the bridle off. That was a mistake. The next morning, after using all sorts of suggestions, persuasion and devices, we finally got this horse's feet tangled up with a rope, whereupon he fell down. This proved to be his undoing, for with one man sitting on his head another forced the bit into his mouth and adjusted the head stall. After this experience he worked, slept and ate with his bridle on."

Mr. East says that he and his companions set out in their wagon in a high spirit of adventure and met adventure unexpectedly when they encountered a horseless carriage at the intersection of Hollywood Boulevard and Cahuenga. The strange vehicle frightened the horses and the animals almost wrecked their conveyance.

"When repairs were made," continues Mr. East, "we set forth again. Out over Cahuenga Pass, where today 60,000 motor vehicles daily rush back and forth, we did not meet a single vehicle of any description.

About one mile beyond Lankershim Boulevard darkness overtook us and we stopped for the night. Unhitching our horses and tying them to the barbed wire fence that lined the roadway, Cummings and the chainman undertook to make the animals comfortable for the night. Taking a lantern from the wagon with the intention of searching for the nearby Los Angeles River, they discovered that although we had a perfectly good lantern we had no coaloil. Proceeding in the dark, Cummings stumbled and plunged headlong into the river. He persevered and in due time returned with a bucket full of water, which was divided between the horses and ourselves."

BOTHERED BY WILD CATS

Mr. East tells of the trip the next day through San Fernando Valley to Calabasas and then on to the Lewis ranch where camp was made under some oak trees alongside the road. During the day the party had passed one horse and rider and a team and wagon.

"We spent a troubled night here under the oaks," Mr. East remembers. "It later developed that the particular spot we had selected for our camp was a favorite congregating spot for wild cats. Just as we were falling asleep, one of our horses emitted an ear-splitting squeal, which brought all hands out of their cots. Although we could see nothing, we threw rocks into the trees until convinced that the wild cats had departed, and returned to our beds. This disturbance was repeated at short intervals until early morning hours, when Cummings, in desperation, suggested we shoot the horses. His proposal was considered and would, without doubt, have been executed had not a faint light in the eastern sky told us that day was breaking. We knew then our wild visitors would leave.

THREE DAYS TO VENTURA

"Getting under way at about eight o'clock on the third day out of Los Angeles, we arrived at the Hunt ranch at three o'clock in the afternoon where we were met by Judge Elliott and a party from Oxnard, come to bid us welcome to Ventura County and inviting us to a baseball game the following day, Sunday, as guests of the city.

"This, at least, was the asserted purpose of the visit. However, as it soon developed, it was in reality the opening shot in a highway battle which was to rage for many years between Oxnard and the remainder of Ventura County over the location of the coast highway. This route was built by way of Camarillo, but in 1919 the legislature added the Oxnard-San Juan Capistrano highway to the State System, thus restoring peace in Ventura.

"We set up camp near the ranch house and later enjoyed a delicious supper as guests of the Hunt family. Later in the evening, being anxious to begin the important job of laying out a State Highway System, we set up a transit and established a north line.

EIGHT-YEAR HIGHWAY PROGRAM URGED BY STUDY COMMITTEE OF NEW YORK

A new order of things for motorists, more and safer modern roads and streets, the end of tax discrimination against motorists, planned highway building, are some of the things possible under the highway plan recently reported by the New York State Highway Study Committee.

"The necessity of adopting a comprehensive program of highway construction arises from the fact that neither this State nor any other State has kept pace in its highway construction with the development of the automotive industry and of motor vehicle transportation," declares the State Legislature's committee.

A high point of the program proposed by the New York Study Committee is the ending of diversion, which has deprived New York motorists of nearly $200,000,000 worth of highway improvements. Under the new plan every cent of a three-cent gas tax and all license fee income will be used for roads and streets only, and not for general purposes.

New York's proposal details an eight-year program to complete the main State highway system and a five-year program to reconstruct and modernize 5,300 miles of busy State roads.

Final snow surveys made during the past month confirm the forecasts of run-off previously published indicating that the 1935–1936 water year will be the best the State has experienced since 1927.

Refinancing programs of the irrigation districts approved by the Districts Securities Commission; applications for repair and construction of dams; progress of topographic mapping and other activities of the Division of Water Resources are detailed in the monthly report of State Engineer Edward Hyatt as follows:

IRRIGATION DISTRICTS AND DISTRICTS SECURITIES COMMISSION

Irrigation Districts.

A field investigation and report were made on the proposal of Linden Irrigation District, relative to their entering into contract for repair of Salt Springs Valley Dam, and for purchase of water stored therein to be diverted to the district.

Request was received from the Districts Securities Commission for a report on the application of Fairoaks Irrigation District, seeking approval of contract to drill test well for supplemental domestic water supply.

At a special election held May 1, 1936, South San Joaquin Irrigation District voted approval of the refinancing program, previously passed upon by the Securities Commission, through which outstanding bonds in the amount of $5,806,250 will be bought up with a loan of $3,978,000 from the Reconstruction Finance Corporation.

Districts Securities Commission.

A regular monthly meeting of the commission was held in San Francisco on May 8, 1936, at which the following business was transacted:

Approval was given to a revised plan for refunding the outstanding bonded debt of Corcoran Irrigation District. First issue bonds in the amount of $733,000, will be retired at approximately 75 cents on the dollar. This to be accomplished by a loan of $484,500 from the Reconstruction Finance Corporation, supplemented by funds provided by the district.

An amended plan of refinancing for Little Rock Creek Irrigation District was approved. Outstanding bonds in the amount of $358,000 are to be retired through a loan of $102,500 from the Reconstruction Finance Corporation, augmented by district funds.

Petition of Linden Irrigation District for approval of agreements entered into with R. G. Kann, by which the district is to secure an additional water supply, was favorably acted upon.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period the maintenance force has been engaged in routine work largely in connection with repair of bridges and structures. Pumping plants Nos. 1 and 3, located in the Sutter By-pass, have been completed by F. W. Snook Company under contract with the California Debris Commission. Pumping Plant No. 2 will be completed in about three weeks. These plants are of the most modern design and are equipped with Worthington pumps and General Electric motors throughout.

Flood Measurements and Gages.

The records for the past flood season are being collected and arranged for report in the office. The operation of all automatic water stage recorders for the season was discontinued on May 1st.

SUPERVISION OF DAMS

Application for approval of the Thomas Briles Dam located in Modoc County was filed on April 30, 1936. This dam was constructed a number of years ago.

Application for the construction of the Long Valley Dam was filed on March 19, 1936, by the Bureau of Water Works and Supply, City of Los Angeles. This application was approved May 12, 1936. The reservoir formed by this dam will be an essential unit of the Owens Valley aqueduct.

In the southern part of the State work is under way on construction of the Cajalco Dam of the Metropolitan Water District and of the San Gabriel Number 1 Dam of the Los Angeles County Flood Control District.

In the Owens Valley area work is being done excavating the sites in preparation for placing of the fill of the Grant Lake and Long Valley dams of the Bureau of Water Works and Supply, city of Los Angeles.

Work of rehabilitation and strengthening of the Lake Hodges Dam of the city of San Diego is progressing.

The placing of additional fill for the enlargement of the Veeh Dam near San Diego is practically completed.

The fill is being placed for the enlargement of Sheffield Dam of the city of Santa Barbara.

(Continued on next page)

Final Snow Surveys Confirm Forecast

(Continued from preceding page)

Work on the enlargement of the O'Shaughnessy Dam for the city of San Francisco is under way with excavations being made for the foundations in the stream bed and abutments.

Construction at the Kent Dam No. 2 in San Mateo County is nearing completion.

Placing of fill has been resumed at the West Valley Dam of the South Fork Irrigation District in Modoc County.

At the Mad River Dam of the city of Eureka exploratory work is still under way.

In addition to the inspections required for construction and repair work, the usual operation and maintenance inspections of a number of dams have been made during the month.

WATER RIGHTS—ADJUDICATICNS

Supervision of Appropriations of Water.

Twenty-six applications to appropriate water were received during April; 17 were denied and 10 were approved. Three permits were revoked during the month and rights under 19 permits were confirmed by the issuance of license.

Field inspections were made in Monterey, Santa Barbara, Los Angeles, Orange, San Diego, Riverside, San Bernardino, and Inyo counties, preliminary to the issuance of license which would confirm the rights under permit.

Water master service for the 1936 season was commenced in the following water master districts about May 1: Hat, Burney and Cow Creek water master districts (in Shasta County).

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Field work was completed during April on the San Bernardino No. 1 and No. 2 Quadrangles in San Bernardino County and progress was made in the mapping of the Tobias Peak Quadrangle in Kern and Tulare counties and the San Bernardino No. 4 Quadrangle in San Bernardino County. Further progress was made on the cultural revision along the San Andreas fault on the Hesperia, San Antonio, San Bernardino and Cucamonga Quadrangles in San Bernardino County.

The field work has been completed and office work is progressing on the Paynes Creek and Burney Quadrangles in Tehama and Shasta counties and the Kreyenhagen Hills Quadrangle in Fresno County.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

During the past month the work has been chiefly toward bringing to completion the compiling of data obtained in 1935 from which to present a report showing the diversions, return flow, stream flow and acreage irrigated in the Sacramento-San Joaquin territory and the encroachment and recession of salinity in the Delta.

Field work preliminary to gathering similar data for 1936 is under way. Recording gages are being installed where necessary on stream flow and return flow channels, staff gage observers are being instructed, salinity observers have been furnished schedules for taking water samples, and all points of diversion are being visited and the diverters furnished with printed forms upon which to record the operation of their pumping plants. Some current meter measurements of diversions have been made.

The stream flow into the Delta from both the Sacramento and San Joaquin valleys remains high and has kept the salt water from encroaching into the Delta channels.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the first week of May the final scheduled snow surveys for this year were completed at all established key courses. These surveys were for the purpose of determining the amount of snow melting that had taken place in the mountains during the preceding month and serve as a check on the estimates of stream flow determined at the end of March and published in the April snow survey bulletin of the division.

The results of these surveys were incorporated in the regular May snow survey bulletin, published May 12th. This is the final bulletin for this year. Inasmuch as the snow melting and also the monthly precipitation during April were just about normal, the April forecasts of run-off as previously published, were not modified in any way.

Office work since the completion of the May bulletin has been devoted to bringing up to date certain precipitation run-off data and to research work regarding the involved relations between the amount of snow on the ground as revealed by the snow surveys, and the spring run-off from the watersheds.

CENTRAL VALLEY PROJECT

Progress has been made by the United States Bureau of Reclamation and the State Department of Public Works on the preparation of plans for preliminary work preparatory to starting construction on the initial units of the project. Surveys are progressing at Kennett and Friant dam sites and along the proposed route of the Contra Costa Conduit and appraisers are working in the field evaluating land and necessary rights of way for the construction of the project. Exploration work was continued during the month at Kennett and Friant dam sites as was the drilling of the proposed site of the combination highway and railroad bridge across the Pit River. The Department of Public Works and all State agencies interested are assisting the Bureau of Reclamation in every way possible in an effort to speed work on the project.

Highway Bids and Awards

For May, 1936

ALAMEDA COUNTY—Furnish and apply armor coat between Scotts Corner and Arroyo Del Valle, about 2.1 miles. District IV, Route 108, Section A. E. E. Dias, Niles, $4,180; Ransome Co., Emeryville, $4,374; Pacific Truck Service, Inc., San Jose, $4,327.50; Palo Alto Road Materials Co., Palo Alto, $4,307.50. Contract awarded to Lee L. Immel, Berkeley, $3,864.

ALAMEDA COUNTY—At San Leandro Street in Oakland under the Southern Pacific Co. and Western Pacific R. R. tracks. District IV, Route Feeder, Section Oak. Barrett & Hilp, San Francisco, $233,981; MacDonald and Kahn Co., Ltd., San Francisco, $232,-769; Eaton and Smith, San Francisco, $220,233; Heafey-Moore Co., & E. T. Lesure, Oakland, $229,738; J. F. Knapp, Oakland, $226,375. Contract awarded to Bodenhamer Construction Co., Oakland, $214,065.10.

CONTRA COSTA COUNTY—Between Broadway Tunnel and 2 miles west of Lafayette, 3.2 miles to be graded and surfaced with plant mixed surfacing on crusher run base. District IV, Route 75, Section A. Heafey-Moore Co., Oakland, $433,589; A. Teichert & Son, Inc., Sacramento, $325,917; George Pollock Company, Sacramento, $396,532; Union Paving Co., San Francisco, $348,301. Contract awarded to Granfield, Farrar and Carlin and John Carlin, San Francisco, $306,236.50.

EL DORADO COUNTY—Between Kyburz and Strawberry, 8.8 miles to be surfaced with crusher run base and plant mixed surfacing. District III, Route 11, Section H. Hanrahan Co., San Francisco, $159,849; A. Teichert & Son., Inc., Sacramento, $164,404. Contract awarded to Union Paving Co., San Francisco, $145,532.50.

IMPERIAL COUNTY—Between Araz and Yuma and between Seeley and Calexico. Furnish and apply liquid asphalt to existing roadbed, 23.8 miles. District XI, Route 27-202, Section B-AB. Paulsen & Marsh, Los Angeles, $6,298; Gilmore Oil Co., Los Angeles, $6,548; Morgan Brothers, Huntington Park, $6,679. Contract awarded to Square Oil Co., Los Angeles, $5,795.

INYO COUNTY—¼ mile north of Bishop to 1.4 mile north of Laws. Furnish and apply SC-2 to existing roadbed, 2.6 miles. District IX, Route 76, Section A. Basich Bros., Torrance, $1,592; Paulsem & March, Incs., Los Angeles, $1,625; Morgan Bros., Huntington Park, $1,443; Oilfields Trucking Co., Bakersfield, $1,622; Lambs Transfer Co., $1,548; Regal Oil Co., Long Beach, $1,493. Contract awarded to Square Oil Co., Los Angeles, $1,343.75.

INYO COUNTY—Furnish and apply SC-2 to existing roadbed 7.0 miles. District IX, Route 63, Section B. Oilfields Trucking Co., Bakersfield, $1,500; Lamb Transfer Co., Long Beach, $1,334; Paulsen March, Inc., Los Angeles, $1,500; Square Oil Co., Inc., Los Angeles, $1,450. Contract awarded to Regal Oil Co., Long Beach, $1,106.

KERN COUNTY—Between 5 miles east of Hart's Station and 2 miles west of Wasco. District VII, Route 33, Section C. Palo Alto Road Materials Co., Palo Alto, $4,092; John Jurkovich, Fresno, $4,550; Oilfields Trucking Co., Bakersfield, $4,100; Square Oil Co., Los Angeles, $4,225; A. S. Vinnell Co., Los Angeles, $4,741; Leo F. Piazza, San Jose, $4,350. Contract awarded to L. A. Brisco, Arroyo Grande, $3,900.

KERN-TULARE-FRESNO COUNTIES—Between Greenfield and north city limits of Fowler (portions) landscaping. District VI, Route 4, Section C Bkd.G. California Nursery Co., Niles, $17,952; Leonard Coates Nurseries, Inc., San Jose, $12,992. Contract awarded to Rexroth & Rexroth, Bakersfield, $9,798.40.

LASSEN COUNTY—Near Bieber Station, an overhead crossing over the Great Northern Railway. District II, Route 28, Section A. J. G. Chigris, San Francisco, $72,742; M. J. B. Construction Co., Stockton, $67,518; Dunn & Baker, Klamath Falls, Ore., $69,884; Fredericksen & Westbrook, Lower Lake, $70,561; P. L. Crooks & Co., Inc., Portland, Ore., $97,761. Contract awarded to Poulos & McEwen, Sacramento, $61,727.15.

LOS ANGELES COUNTY—For landscaping 3 miles between Monrovia and Azusa. District VII, Route 9, Section G. N. P. Valkenburg, Los Angeles, $2,699. Contract awarded to Peterson Bros., Inglewood, $1,829.56.

LOS ANGELES COUNTY—Between Castaic School and Piru Creek, 6.8 shldr. mi. bit. mac. and plant-mixed surf. shldrs. District VII, Route 4, Section G.H. Southwest Paving Co., Inc., Roscoe, $31,880; P. J. Akmadzich, Los Angeles, $33,390. Contract awarded to Geo. R. Curtis Paving Co., Los Angeles, $29,887.25.

MODOC COUNTY—Between Hot Creek and Cedarville Mountain and between southern boundary and Alturas, 32.9 miles oil treatment to portion and seal coat entire project. District II, Routes 28, 73, Sections BC, C.D. Hayward Building Material Co., Hayward, $21,343; Dunn & Baker, Klamath Falls, Ore., $21,693; J. C. Compton, McMinnville, Ore., $24,251. Contract awarded to C. F. Fredericksen & Sons, Lower Lake, $18,959.65.

MONO COUNTY—Between 2 miles south of Rush Creek and 2 miles north of Leevining, grade and bit. tr. sel. matl. surf. District IX, Route 23, Section G,H. Isbell Construction Company, Reno,, Nev., $145,-434; George Pollock Co., Sacramento, $162,210. Contract awarded to Basich Bros., Torrance, $119,350.50.

ORANGE COUNTY—Between Seal Beach and Newport Beach, 9.8 miles P. C. C. pavement widening. District VII, Route 60, Sections S1B, A, Npt.B. Matich Bros., Elsinore, $146,326; J. E. Haddock, Ltd., Pasadena, $150,108.50; C. O. Sparks and Mundo Engineering Co., Los Angeles, $176,180; Griffith Co., Los Angeles, $162,440; Oswald Bros., Los Angeles, $160,663. Contract awarded to Geo. R. Curtis Paving Co., Los Angeles, $143,965.50.

ORANGE COUNTY—Between Gypsum Creek and Riverside County line, 2.7 miles to be graded and paved with P. C. C. District VII, Route 43, Section B. Griffith Co., Los Angeles, $168,278; Daley Corp., San Diego, $198,595; J. E. Haddock, Ltd., Pasadena, $192,-781; Oswald Bros., Los Angeles, $174,467; United Concrete Pipe Corp., Los Angeles, $233,696. Contract awarded to Gibbons & Reed Co., Burbank, $165,813.75.

ORANGE AND LOS ANGELES COUNTIES—Between Routes 183 and 179 and between Route 60 and Santa Ana River. Constr. ab't 15.4 miles of shoulders with import. borrow. District VII, Routes 171 and 179, Sections A, A. C. D. Gifford, Receiver Owl Truck & Materials Co., Compton, $30,191; Mojave Corp., Los Nietos, $19,882. Contract awarded to Parish Bros., Los Angeles, $14,520.

PLUMAS COUNTY—Between 4 miles east of Beckwourth & Ede's Ranch 5.6 mile grade and pen. oil treatment. District II, Route 21, Section G. Harms Bros., Doyle, $32,364; A. Teichert & Son., Inc., Sacramento, $33,917; J. B. Galbraith and Don A. Canevari, Santa Rosa, $31,068; M. J. B. Const. Co., Stockton, $39,793. Contract awarded to Fredericksen & Westbrook, Lower Lake, $29,750.50.

RIVERSIDE COUNTY—About 2.2 miles west of Indio, 1.3 miles grade and P. C. C. pavement. District XI, Route 26, Section E. Oswald Bros., Los Angeles, $65,080. Contract awarded to B. G. Carroll, San Diego, $61,720.50.

RIVERSIDE COUNTY—Between Temecula River Br. and Sly. Bdy., and between Sage and 4.2 miles south of Hemet; 27.6 miles; road mix surf. tr. rd. bd. District VIII, Routes 78, 194, Sections AB, B. Geo. Herz & Co., San Bernardino, $16,653; R. E. Hazard & Sons, San Diego, $16,906; Clyde W. Wood, Stockton, $18,664; Dimmitt & Taylor, Los Angeles, $23,436; Matich Bros., Elsinore, $17,016; Oswald Bros., Los Angeles, $19,314; A. S. Vinnell Co., Los Angeles, $16,339. Contract awarded to Oilfields Trucking Co., Bakersfield, $13,081.81.

RIVERSIDE COUNTY—1 mile north Box Springs an overhead crossing over A. T. & S. F., 1-37', 2-34', 2-8' spans to be constructed. District VIII, Route 19, Section C. Byerts & Dunn, Los Angeles, $19,260; John Oberg, Los Angeles, $18,890; Robert D. Patterson, Santa Barbara, $19,305; R. R. Bishop, Long Beach, $20,618; J. F. Haddock, Ltd., Pasadena, $19,680; Oswald Bros., Los Angeles, $18,970. Contract awarded to D. A. Loomis, Glendale, $17,022.70.

SAN BENITO COUNTY—San Benito County, 120' bridge to be salvaged from Pacheco Creek and erected at San Benito River, and 100' San Benito River bridge to be salvaged. District V, Routes 22, 119, Sections B, D. W. J. Tobin, Oakland, $4,624; Union Paving Co., San Francisco, $5,138. Contract awarded to Lord & Bishop, Sacramento, $3,850.

SAN BERNARDINO COUNTY—Between Vidal and Route 58, between Doble and 20 miles northerly and between Route 26 and 11.5 miles northerly, about 76.5 miles road mix surf. trmt. to be applied. District VIII, Routes 146, 43, 187, Sections A, B, C, D, H, J, K, E. A. Clyde W. Wood, Stockton, $109,824; A. S. Vinnell Co., Los Angeles, $101,508; Oswald Bros., Los Angeles,

(Continued on next page)

Highway Bids and Contracts Awarded in Month of June

(Continued from preceding page)

$117,453; Dimmitt & Taylor, Los Angeles, $114,246. Contract awarded to R. E. Hazard & Sons, San Diego, $88,083.60.

SAN BERNARDINO COUNTY—Highway roadside landscape project between Alabama Street and State Street in Redlands, about 1.9 miles in length. District VII, Route 26, Section A and Rld. Matich Bros., Elsinore, $13,232; S. A. Cummings, San Diego, $6,816. Contract awarded to Peterson Bros., Inglewood, $6,607.14.

SAN BERNARDINO AND RIVERSIDE COUNTIES—Various locations, 19.4 miles plant-mixed surfacing (SC Type) and seal coat. District VII, Routes 31, 190, 64, Sections A C, C E, L. A. S. Vinnell Co., Los Angeles, $67,596. Contract awarded to George Herz & Co., San Bernardino, $63,603.20.

SAN DIEGO COUNTY—Bridge across Santa Margarita R. 2½ miles north of Oceanside. District XI, Route 2, Section C. V. R. Dennis Const. Co., San Diego, $295,693; Dimmitt & Taylor, Los Angeles, $222,900; Shofner & Gordon, Los Angeles, $233,081; Pacific Bridge Co., San Francisco, $236,377; B. O. Larsen, San Diego, $181,063; J. E. Haddock, Ltd., Pasadena, $251,961. Contract awarded to C. W. Wood, Stockton, $175,529.65.

SAN LUIS OBISPO COUNTY—Between 1 mile east of Pozo and Kern County line, about 40.6 miles, liquid asphalt to be furnished and applied to existing roadbed. District V, Route 58, Sections B, C, D and E. L. A. Brisco, Arroyo Grande, $12,636; Square Oil Co., Los Angeles, $12,870; Paulsen & March, Inc., Los Angeles, $12,116; Oilfields Trucking Co., Bakersfield, $13,624. Contract awarded to Lambs Transfer Co., Long Beach, $12,038.

SHASTA COUNTY—Between forest bdy. on Route 20 and Bridge Camp on Route 83, about 21.6 miles in length, seal coat to be applied. District II, Route 20 and 83, Sections E, A-B. E. F. Hilliard, Sacramento, $10,759; Hayward Bld. Material Co., Hayward, $11,529; Dunn & Baker, Klamath Falls, Ore., $12,192; C. F. Fredericksen & Sons, Lower Lake, $12,780; Palo Alto Road Materials Co., Palo Alto, $14,772. Contract awarded to Pacific Truck Service, Inc., San Jose, $8,454.

SIERRA AND NEVADA COUNTIES—Between Downieville and Route 83, between 7.1 miles north of Truckee and 5.7 miles north of Nevada-Sierra county line, and between Sierraville and Calpino, about 48.2 miles of penetration oil treatment to be applied. District III, Routes 25 and 83, Sections, various. C. F. Fredericksen & Sons, Lower Lake, $10,522; Lee J. Immel, Berkeley, $10,971; Oilfields Trucking Co., Bakersfield, $11,362; Pacific Truck Service, Inc., San Jose, $10,821; Hayward Bldg. Mtls. Co., Hayward, $10,788. Contract awarded to Edw. F. Hilliard, Sacramento, $10,297.

TULARE COUNTY—Between wly. bdy. and 4 miles east and between Yettem and Lemon Cove, 24.6 miles road-mix, shoulders and armor coat, portions of pavement. District VI. Routes 131, 129, Sections A B C, E. M. J. B. Construction Co., Stockton, $34,798; L. A. Brisco, Arroyo Grande, $27,485; A. S. Vinnell Co., Los Angeles, $29,240; Stewart & Nuss, Inc., Fresno, $25,336. Contract awarded to Palo Alto Road Materials Co., Palo Alto, $24,401.

TULARE COUNTY—Between 2.7 miles and 13.5 miles east of Porterville. (Road-mix surface treatment (shoulders). District VI, Route 127, Section B. Oilfields Trucking Co., Bakersfield, $5,599; Square Oil Co., Los Angeles, $3,210; A. S. Vinnell Co., Los Angeles, $4,645; Stewart & Nuss, Inc., Fresno, $4,330; L. A. Brisco, Arroyo Grande, $4,197. Contract awarded to Palo Alto Road Materials Co., Palo Alto, $3,143.

VENTURA COUNTY—Within Camarillo State Hospital Grounds, grade and A. C. and P. C. C. pavement. District VII, Camarillo State Hospital. Contract awarded to Oswald Bros., Los Angeles, $18,164.

YOLO COUNTY—Between Yolo Causeway and M Street subway, 3.5 miles to be graded and paved with asphalt concrete. District III, Route 6, Sec. C. Heafey-Moore Co., Oakland, $183,537; Union Paving Co., San Francisco, $159,184. Contract awarded to A. Teichert & Son, Inc., Sacramento, $157,485.10.

CARRY ON!

THE miner drives the tunnel and
The weaver runs the loom,
Though twenty wizards prophesy
The dismal day of doom.

The builder sets the girder,
The farmer tills the farm,
Though thirty anxious editors are
Viewing with alarm.

And science, art and industry
Propel the world along,
Though forty experts testify that
Everything is wrong.

Then gayly help to decorate your
Little nook or space,
Though fifty college faculties have
Flunked the human race.

—ARTHUR GUITERMAN.

Each Dollar Spent on Roads Develops $3 in Other Business

HIGHWAY construction not only provides roads, but also plays a vital part in the restoration of general business to a sound basis. This is revealed in a recent survey made by the United States Bureau of Public Roads.

The survey indicates that every $1 expended on roads initiates a movement which results in the distribution of $3.15 in wages and materials and that for every four men put to work on highways, employment is created for seven additional workers in twenty-four different industries.

An annual expenditure of $1,000,000,000 on road work would furnish continuous employment for twelve months for more than 1,000,000 persons, about equally divided between urban and rural areas. Of this number less than 40 per cent would be employed on road work directly, the remaining 60 per cent in industries.

Business transactions beneficial to many industries and many different communities result from every order for highway materials. Each successive stage in the processing of materials represents the distribution of enormous sums for labor, equipment, materials and other expenses which make up the cost of doing business.

It is the total value of the business thus stimulated which multiplies the value of each dollar invested in highway work.

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